



VOL. 45, No. 6

JUNE 1977

## CONTENTS

### TECHNICAL

Audio Phase Shift Network for Solid State Phasing SSB	10
Commercial Kinks	18
Effect of Ground on Directional Pattern of a 14 MHz Antenna	7
Radio Teletype — Part 5	14
Simplified Audio Filtering	12
Try This	22

### GENERAL

Amateur Exam — February 1977	23
John Moyle Memorial National Field Day Results — 1977	27
Oldtimer wins Ross Hull	25
Ross Hull VHF/UHF Memorial Contest — 76/77 Results	25

### DEPARTMENTS

Afterthoughts	6
Around the Trade	30
Awards Column	27
Contests	25
Hamads	30
IARU News	18
Intruder Watch	27
Ionospheric Predictions	29
LARA	28
Letter to Editor	18
Magazine Index	15
Project Australia	28
QSP	3, 6, 8, 15, 20, 30
Silent Keys	30
VHF-UHF—an expanding world	19
WIANEWS	5
20 Years Ago	26

### COVER PHOTO

Michael Owen VK3KI (right) presents Peter Williams VK3IZ (left) with an engraved plaque in recognition of Peter's role in the formation and establishment of the International Amateur Radio Union — Region 3. (See IARU News on page 18.)

The presentation was made at the 1977 Federal Convention held in Melbourne over the Anzac Day weekend.

— Photo by Cyril Maude, VK3ZCK.

# HAM

# RADIO SUPPLIERS

323 ELIZABETH STREET, MELBOURNE, VIC., 3000

Phones: 67-7329, 67-4286

Our Disposals Store at 104 HIGHETT ST., RICHMOND (Phone 42-8136) is open Mondays to Fridays, 9.00 a.m. to 5.00 p.m. and on Saturdays to midday.

## MODEL OL84 D/P MULTIMETER

Very ruggedly constructed this model is particularly suitable for workshops. It features special scales for measurement of capacitance and inductance. Diode protected movement. Specifications: 20,000 ohm/volt DC; 6,000 ohm/volt AC; DC volts — 0.25; 1; 2.5V; 10; 50; 250; 1,000; 5,000; AC volts — 10; 50; 250; 1,000; DC amps: 50  $\mu$ A; 1 mA; 50 mA; 500 mA; 10 A. Ohms — 4 K ohm; 400 K ohm; 4 M ohm; 40 M ohm. Centre scale — 40 ohm; 4,000 ohm; 40,000 ohm; 400,000 ohm. Decibel: —20 to +62 dB. Dimensions: 5" x 4-1/8" x 2"; 152 x 107 x 51 mm. Inductance — 0/5000H. Carrying case available. Model C \$6.90.



**\$29.90** Postage \$2.20

## MODEL CT-500/P MULTIMETER

Of intermediate size, this popular multimeter combines high accuracy with versatility over 24 ranges. Mirror Scale. Diode protected movement.

SPECIFICATION: 20,000 ohm/volt DC; 10,000 ohm/volt AC; DC Volts: 2.5, 10, 50, 250, 500, 500V; AC Volts: 10, 50, 250, 500, 500V; DC Amps: 50  $\mu$ A, 5 mA, 50 mA, 500 mA. Ohms: 12k ohm, 120k ohm, 1.2M ohm, 12M ohm. Centre Scale: 20 ohm, 200 ohm, 2,000 ohm, 20,000 ohm. Decibel: —20 to +62 dB. Dimensions: 5 1/2" x 3-5/8" x 1 1/2" inches. Carrying case available. Model B — \$5.90.

Price: \$24.90 — Postage \$2.20.

## MODEL AS100 D/P MULTIMETER

This meter features double zero diode meter protection and 3 1/2" full view easy to read 2 colour scale. It is fitted with polarity reversing switch and housed in a strong moulded case with carrying handle.

SPECIFICATION: 10,000 ohm/volt DC; 10,000 ohm/volt AC; DC Volts: 0.3, 3, 12, 60, 120, 300, 500, 1,000; AC Volts: 0.3, 3, 12, 60, 120, 300, 500; DC Amps: 10  $\mu$ A, 5 mA, 50 mA, 500 mA, 12A. Ohms: 2k, 200k, 2M, 20M, 200M ohm. Centre Scale: 20 ohm, 2,000 ohm, 20,000 ohm, 200,000 ohm, 2M ohm. Decibel: —20 to +57 dB. Dimensions: 7-3/8" x 5-2/8" x 2-3/8" in. Carrying case for model I — \$7.90.

Price: \$52.50 — Postage \$2.20.

## KARPACK VOLTAGE ADAPTOR

Operates from car cigarette lighter socket. 12V neg. earth cars only. Output 6V, 7.5V and 9V (switched) to 300 mA max.

**\$6.90** — Post \$1.

## 200-H.

30° quadrant meter.

Pocket size.

AC/V: 10V, 50V, 100V, 500V, 1000V (10,000 ohm/V); DC/V: 5V, 25V, 50V, 250V, 500V, 1000V (100,000 ohm/V); DC/A: 50  $\mu$ A, 2.5mA, 250mA; Ohm: 60k ohm, 5M ohm. Capacitance: 100pF to 0.1  $\mu$ F, 0.01  $\mu$ F to 1  $\mu$ F; dB: —20dB to +22dB. Audio Output: 10V, 50V, 120V, 1000V AC. Approx. size: 4 1/2" in. x 3 1/2" in. x 1 1/2" in. **\$16.90**. Postage \$1.50.



## POCKET MULTIMETER

### SPECIAL



## MODEL C1000M MULTIMETER

Compact, handy and versatile, the C1000M is the ideal low cost pocket meter. Mirror Scale. Specifications: 1,000 Ohm/Volt DC; 1,000 Ohm/Volt AC; DC volts: 10; 50; 250; 1,000; AC volts: 10; 50; 250; 1,000; DC amps: 1 mA; 100 mA; Ohms: 150  $\Omega$ ; Centre scale: 3 K  $\Omega$ ; Decibel: —10 dB to 22 dB; Dimensions: 3-1/2" x 2-3/8" x 1-1/8" 90 x 60 x 36 mm.

**\$9.75**

POST \$1.00

## CT-500 — \$24.90 — Postage \$2.50

Popular, medium-size, mirror scale. Overload-protected.

AC/V: 10V, 50V, 250V,

500V, 1000V (10,000 ohm/V);

DC/V: 2.5V, 10V, 50V, 250V,

500V, 5000V (20,000 ohm/V);

DC/A: 50  $\mu$ A, 5 mA, 50 mA,

500 mA.

Ohm: 12k ohm, 120 k ohm,

1.2M ohm, 12M ohm.

dB: 20 dB to +62 dB.

Approx. Size: 5 1/2" x 3 5/8" x 1 1/8". P&P 50c



## YAESU FRG-7

THE RADIO FOR WORLD-WIDE LISTENING AT ITS BEST — 0.5-29.9 MHz COVERAGE SYNTHESIZED COMMUNICATION RECEIVER



The model FRG-7 is a precision built high performance communication receiver designed to cover the band from 0.5-29.9 MHz. Its state of the art technology offers an unprecedented level of versatility. The Wadley Loop System (drift cancellation circuit) coupled with a triple conversion super heterodyne system guarantees an extremely high sensitivity and excellent stability. It provides complete satisfaction to amateurs as well as BCLs with superb performance and many features such as RF attenuator, selectable tone, and automatic noise suppression circuit.

**\$328**

## HIGH QUALITY 3-WAY CROSSOVER — \$9.95

AND 2-WAY NETWORK — \$7.90

D.D.K. CROSS OVER NETWORK:

Imp: 8 ohm; C.O. Freq.: 500, 4500 Hz; Power

Cap: 70 watts RMS.

Red Dot: Woofer; Orange Dot: Midrange; Blue

Dot: Tweeter; Green Dot: Input.

Postage \$1.20

## SPEAKER WIRE — 100 metre rolls

**\$11.90** per roll — post free.

## WALKIE-TALKIES — 100 Milliwatt

7 Trans. Call Buzzer, Superhet System, 9V Battery, PMG approved, 27,240m xtal. Complete with booklet. **\$52.80** Pair — post free.

## INTERCOMS

2 STATION AND 9V BATTERY ... **\$12.90** each

3 STATION AND 9V BATTERY ... **\$16.90** each

4 STATION AND 9V BATTERY ... **\$26.90** each

Complete with 60 ft. wire. Ideal for garage, baby room, etc. — Postage \$1.50.

## CB POWER SUPPLY

240V in. 13.8 out. 1 amp continuous.

**\$34.00** — P&P \$1.50.

# SPECIAL

## 9" x 6" SPEAKERS

Brand new, in carton, 4 ohm impedance. Ideal for car cassettes, radios, etc.

**\$4.00** each

Postage \$1.00

**10 for \$30.00**

**BULK BUY**



## BARLOW-WADLEY XCR-30

a truly portable communications receiver, based on the WADLEY LOOP principle, the same principle as applied in the

DELTAHET and RACAL receivers. A truly crystal-controlled highly sensitive multiple-heterodyne portable receiver of exceptional stability with continuous, uninterrupted coverage from 500 kHz to 31MHz.

All for **\$310.00** F.O.R.

**MAIL ORDERS WELCOMED.** Please allow pack and post on items listed on this page. If further information required send a stamped SAE for immediate reply from the above address. Larger items can be sent F.O.B. Due to circumstances beyond our control, prices quoted in this advertisement are subject to alteration without notice. New equipment available at our Bridge Road Store.

# amateur radio QSP ADVANCING THE STATE OF THE ART

Published monthly as its official journal by the Wireless Institute of Australia, founded 1910.

JUNE 1977

Vol. 45, No. 6

PRICE: 90 CENTS

(Sent free and post paid to all members)

Registered Office:  
2/517 Toorak Road,  
Toorak, Victoria, 3142.

Registered at the G.P.O. Melbourne for transmission by Post as a Periodical — Category "B".

EDITOR:  
BRUCE BATHOLDS\* VK3UV

ASSISTANT EDITOR:  
RON COOK\* VK3AFW

TECHNICAL EDITORS:  
BIL RICE\* VK3ABP  
GIL SOMES\* VK3AUI  
KEN PALLISER VK3QJ

CONTRIBUTING EDITORS:  
BRIAN ALSTIN VK5CA  
RODNEY CHAMPNESS\* VK3UG  
DAVID DOWN VK3OH  
RON FISHER\* VK3OM  
DAVID HULL VK3ZDH  
ERIC JAMIESON VK3LP  
KEN JEWELL VK3AKK  
PETER MILL VK3ZRP  
KEVIN PHILLIPS VK3ALU  
LEN POYNTER\* VK3ZGP

DRAFTING:  
ALL DISTRICTS DRAFTING SERVICE  
KEN GILLESPIE VK3GK

PHOTOGRAPHER:  
REG GOUDGE —

BUSINESS MANAGER:  
PETER ODDO VK3CJF

ADVERTISING REPRESENTATIVE:  
TOM COOK

\*Member of Publications Committee

enquiries and material to:  
The Editor,  
PO Box 2811W, GPO Melb., 3001

Copy is required by the third of each month. Acknowledgment may not be made unless specially requested. All important items should be sent by certified mail. The Editor reserves the right to edit all material, including Letters to the Editor and Hamads, and reserves the right to refuse acceptance of any material, without specifying any reason.

Advertising:  
Advertiser's material should be sent direct to P.O. Box 150, Toorak, Vic., 3142, by the 25th of the second month preceding publication. Phone: (03) 24 8652.

Hamads should be sent direct to P.O. Box 150, Toorak, Vic., 3142, by the 3rd of the month preceding publication.

Trade Practices Act:  
It is impossible for us to ensure that advertisements submitted for publication comply with the Trade Practices Act 1974. Therefore advertisers and advertising agents will appreciate the absolute need for themselves to ensure that the provisions of the Act are complied with strictly.

Printers: EQUITY PRESS PTY. LTD.  
50-52 Islington Street, Collingwood, 3066  
Tel: 41-5054, 41-5055

What do we all understand by "advancing the state of the art"?

Perhaps the use of Oscar satellites for long distance VHF/UHF communication, or maybe solid-state digital techniques for RTTY or SSTV, or even the use of UHF repeaters as an aid to mobile communication. Australian amateurs are indeed employing not only the above advanced techniques but also many more.

It is quite obvious, however, that "advancing the state of the art" will mean different things to different amateurs.

The 1296 MHz contact between VK5 and VK6 earlier this year excited many amateurs and raised the odd eyebrow world-wide. The sceptics will say "that if one waits long enough, of course the band will open" — maybe. One of the stations used SSB — SSB on 1296 MHz—what's the point? Why there aren't many commercial VHF SSB systems in use — let alone SSB on UHF or SHF!

In VK2 a small band of microwave enthusiasts are quite active on most of the amateur allocations up to 10 GHz and over the years there has been sporadic activity on 1296 and 2300 MHz in VK3 with even less known activity in the other States.

In Europe, considerable effort is being put into popularizing the microwave bands. A recent report in "Radio Communication" (RSGB) mentioned a meeting of IARU Region 1 VHF Managers in Amsterdam where it was suggested that "given the effort over the next year or two, it is quite possible for amateurs to make a significant change in their use of microwave bands which could well influence our position at WARC 79".

The same article went on to mention that what is needed to stimulate activity on these bands is one or two proven, bug-free designs for equipment and LOTS more operating.

"Lots more operating" is certainly needed in Australia, especially on the higher frequency amateur bands. So there is a need for amateurs — who are involved in state of the art activities — to inform others of their work.

Tell us what you are doing.

P. A. WOLFENDEEN VK3ZPA,  
Chairman VHF/UHF Advisory Committee.

## QSP

### AMATEUR EXAMINATIONS

The August AOCP theory exam, we are told, will be of the usual essay-type question.

However, it is likely that the February 1978 exam is going to be of the objective, multi-choice format.

The Federal Education Committee wishes to assist the P and T Department to produce an exam book of suitable questions. We therefore invite questions, preferably typewritten (indicating in pencil the correct answer), to be forwarded from all States.

This is an opportunity to assist the P and T Department to develop a bank of questions at a depth level which is generally accepted as satisfactory for amateur exams.

The format of Novice 5 w.p.m. CW exams is being investigated with P and T Department. The main question is spacing of characters in letters and between words. This is being closely looked at, and it is hoped that agreement can soon be reached on a satisfactory format for the exam.

VK3ZR

### 1977 CALL BOOK

Your last opportunity to be listed correctly in the 1977 Call Book is NOW. If your address label is incorrect in any detail this error will go through to the Call Book because the listings will derive from the same EDP file. Write now. This applies to any changes in call sign or the addition of any call sign or any different call sign to the one listed in the 1975 Call Book. Zones, clubs, groups, repeater groups, school clubs and others please take note and act on the above now. Next week will be too late.

### 2M BEACONS

From Radio 2S of January 77 comes news that the first two metre beacon was put into operation at Alvertstone near Durban as ZSSVHF on 144.925 MHz. Five other beacons are planned for the Republic — Cape Town, ZS1BHF on 144.92 MHz, Grahamstown ZS2VHF on 144.91, Hamis-mith ZS4BHF 144.90, Johannesburg ZS6JHB 144.915, and Potgietersrust ZS8TIB on 144.905 MHz. Yet another beacon now in operation is in Mbabane, Swaziland. 3D6AX on 144.735 MHz.

### NEW PREFIX

For the period 4th June to 12th June this year the prefix GE may be heard in place of the familiar G, GM, GW, etc., prefixes. This was stated to be a one-off concession to mark HM the Queen's Silver Jubilee celebration. Radio Communication April 77.

### 1976 VK/ZL/OCEANIA DX CONTEST

1. Almost 1,200 logs were received.
2. Entry of ZL2GJ was omitted from Phone result — 1,355 points.
3. An error was made in ZL 40 metre CW results. ZL1AMO with 7,620 points was THIRD and not ZL1AH.

ZL2GX



# FT-301D

## All Solid State

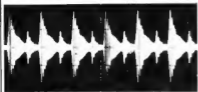
### Digital Readout HF Multi-Mode Transceiver



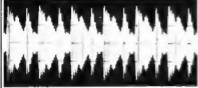
The FT-301D is an advanced fully solid state Digital Readout SSB, AM, FSK and CW transceiver covering 160kHz thru 10MHz including one auxiliary band and WWV. It has all the outstanding features of Yaesu's top performance FT-101E (inc. RF Processor) plus many more additions (Digital Readout, I.F. Rejection filter, & switchable AGC time constant).

#### RF PROCESSOR

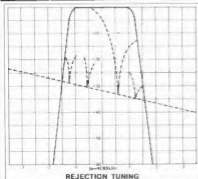
The RF Processor increases talk power to cut through the pile-ups without addition of a linear amplifier.



RF Processor "OFF"



RF Processor "ON"



REJECTION TUNING

#### FEATURES

- ALL Solid State — 27 IC, 47 TR, 24 FET and 94 diode
- ALL Band — 160 through 10 meter plus receive only for WWV/JY
- ALL Modes — SSB (USB/LSB selectable), CW, AM and FSK
- Digital Dial Readout — by large LED diode
- 200 Watts PEP INPUT for SSB, CW and 50 Watts for AM, FSK
- RF Feedback — for clean signal
- Rejection Tuning — tunable crystal filter rejection
- Effective Noise Blanker — for elimination of noise spikes
- RF Speech Processor — for increased talk power
- Built-in fully adjustable VOX
- Automatic break-in CW operation with sidetone
- Selectable 25 kHz/100 kHz calibrator, 2.5 kHz TX/RX or RX clarifier with separate ON/OFF switch
- Selectable, amplified AGC system — SLOW, MEDIUM and FAST
- Built-in internal crystal control (11 channels) provision and dual VFO adaptor
- Adjustable carrier level for tune-up and novice operation
- Triple protection circuits for PA stage and warning system
- 9-pole SSB filter for unparalleled selectivity
- Built-in speaker
- Compact size, light weight
- Complete line of compatible accessories for flexible station design

#### TECHNICAL DATA

**GENERAL**  
**Frequency Range:** 1.8—2.0 MHz, 3.5—4.0 MHz, 7.0—7.5 MHz, 14.0—14.5 MHz, 21.0—21.5 MHz, 27.0—27.5 MHz, 28.0—29.9 MHz, WWV 5 MHz (receive only)  
**Mode:** SSB (selectable USB or LSB), CW, AM or FSK  
**Frequency Stability:** Within 100 Hz during any 30 minute period after warm-up. Not more than 100 Hz with 10% line voltage variation.

**FT-301D Accessories everything you want in a complete home station design.**

YAESU's years of experience in the radio amateur field are exemplified in the FT-301D series. The FT-301D can be interconnected to its matching power supply and external VFO unit. This feature provides you with a completely integrated home station with transceive operation on either

VFO split frequency, or crystal controlled operation with a flip of the switch. The FT-301D with built-in speaker is a complete AC power supply and can be used for any of the following supply voltages: 100/110/117/200/220/234 Volts, 50/60 Hz. A digital clock and

automatic call sign identifier are an integral part of the power supply. The time display can be selected for either a 24-hour or 12-hour system with a flip of the switch on the front panel. A programmable identifier transmits your call sign in Morse code automatically every ten minutes.

• AC Power Supply  
 FP-301D

• AC Power Supply  
 FP-301

• External VFO  
 FV-301

• Monitor Scope  
 YO-301

#### TUNABLE REJECTION TUNING

The tunable IF rejection filter utilizes sharp resonance characteristics of a crystal filter. The resonance frequency is tunable over the entire IF range to reject any interferences close to or inside the IF pass band.

#### Calibration Accuracy: 2 kHz maximum after 100 kHz

**Backlash:** Not more than 50 Hz  
**Antenna Impedance:** 50 ohm unbalanced nominal  
**Circuitry:** 24 FETs, 47 Transistors, 27 integrated Circuits and 94 Diodes  
**Power Requirements:** 13.5 VDC nominal, 1.1 A (digital type) and 0.9 A (anal type) for receive and 21 A for transmit  
**Size:** 280(W) x 125(H) x 270(D) mm  
**Weight:** Approx. 9 kg

#### TRANSMITTER

**Input Power:** 200 Watts PEP on SSB, 200 Watts on CW at 50% duty cycle and 50 Watts on AM and FSK. (Slightly lower on 10 meter and 160 meter bands)  
**Microphone:** 500 ohm dynamic type  
**Carrier Suppression:** —40 dB  
**Sideband Suppression:** —50 dB  
**Spurious Radiation:** —40 dB  
**Distortion Products:** —31 dB  
**Frequency Response:** 300 to 2700 Hz  $\pm$  3 dB  
**Final Transistor:** 5Y35 x 2

#### RECEIVER

**Sensitivity:** 0.25  $\mu$  V for 10 dB Noise plus Signal to Noise Ratio on 1.4 MHz  
**Selectivity:** 2.4 kHz nominal bandwidth at 6 dB down, 4.0 kHz at 60 dB down on SSB, CW and AM 600 Hz nominal bandwidth at 6 dB down, 1.2 kHz at 60 dB down with optional CW filter, 6 kHz nominal bandwidth at 8 dB down, 12 kHz at 60 dB down with optional AM filter  
**Harmonic & Other Spurious Response:** Image Rejection better than 50 dB, Internal Spurious Signal below 1  $\mu$  V equivalent to antenna input  
**Automatic Gain Control:** AGC threshold nominal 3  $\mu$  V, Attack time is 8 milli-seconds and release time is selected from 3500, 1500 and 200 milli-second on front panel  
**Audio Noise Level:** Not less than 40 dB below 1 Watt  
**Audio Output:** 3 Watts to internal or external speaker at 4 ohm impedance  
**Audio Distortion:** Less than 10% at 3 Watts output

• AC Power Supply  
 FP-301D

• AC Power Supply  
 FP-301

• External VFO  
 FV-301

• Monitor Scope  
 YO-301

#### PRICES

FT-301D inc. AM Filter	\$1147
FP-301	\$169
FP-301D	\$289
FV-301	\$149
YO-301	\$345

Above prices include S.T. Freight and insurance is extra. 90 day warranty. Prices and specifications subject to change.



**ELECTRONIC SERVICES**

60 Shannon St., Box Hill North, Vic. 3129, Phone 89 2213  
 Agents in all States and A.C.T.

FRED BAIL VK3V5  
 JIM BAIL VK3ABA

JAS7677-22

# WIANEWS

A special report on the 1977 Federal Convention will appear in AR next month. It is not intended to duplicate news items from the Convention but one or two deserve earlier publicity.

## "CB"

This is the Position Paper, relating to CB, adopted at the Convention after very considerable discussions in a working group and later in the Convention itself —

- "1. That the Amateur Radio Service is accurately defined by ITU Regulations.
2. That the 'CB' type operations by non-technically qualified operators is entirely different in character from the amateur radio service.
3. That a 'CB' type service could not be regarded as part of the amateur radio service.
4. That it is highly undesirable and totally unacceptable to combine 'CB' and amateur radio on the same frequency band.
5. That all radio services should be subject to regulation and that regulation should be enforced. Unlawful use of spectrum space, particularly that allocated to legitimate services, should be subject to prosecution.
6. That without expressing judgement on a 'CB' service as such, other established services should not be required to give up frequency allocations for such a service.
7. That the usage of frequency by a 'CB' type service should not be in derogation of the ITU Convention and Regulations (e.g., an avenue for international communications).
8. That the introduction of a 'CB' type service must not in any manner result in or contribute towards the reduction or unwarranted variation of conditions applicable to the amateur radio services or which would result in the imposition of conditions less advantageous to the amateur in respect of present technical standards."

## ARNOLD REPORT

After very considerable discussion the Convention authorised the issue of the following statement about the Investigator's Report by Bob Arnold (as published in AR April 1976) —

"In not adopting the Report the Federal Council noted that the organisational proposals were not considered to be appropriate at this stage, but that the other recommendations were being actively considered by the Executive and in a number of cases had already been adopted and implemented, namely —

### Federal News: 1. News Tapes:

Communication has been improved between the WIA Executive office and members by the use of weekly broadcast tapes for propagating up-to-date information. Not only are these tapes being used for Divisional broadcasts but they are also being used as part of broadcasting stations' Amateur Radio News programmes (in Victoria 3CR and 3HA make use of tapes supplied by the Victorian Division).

### 2. WIANEWS:

In addition to the broadcast tapes stop press information to members and clubs has been stepped up via WIANEWS and inserts in Amateur Radio magazine. This regular feature aims to cover relevant items of news from sources both within Australia and overseas."

## CALL BOOK

The Institute has been successful in negotiating a new contract with the P and T Department for the publication of call books over the next 10 years. These call books will be making use of the Institute's EDP (computer) records to improve accuracy and reduce the workload associated with the publication of this very important document.

## MEMBERSHIP DRIVE

In an effort to increase membership of the Institute a campaign ("8000") was implemented during 1976. This membership drive is especially important when it is realised that WARC 79 is only two years away. It is proposed to continue this campaign with vigour.

# SCALAR

## for Antennae



Illustrated is a BASE STATION ANTENNA  
Omnidirectional Gain 3 dB and 6 dB  
Models G11, G21, G22.

Scalar's range of HIGH GAIN base station antennas provide an omnidirectional radiation pattern combined with gains of 3 dB and 6 dB depending on Model number. They are designed as base station antennas for two-way radio systems. Constructed of high grade aluminium, the radiating elements are completely enclosed within a fibreglass radome.

### C.B. CITIZEN BAND AND PAGING ANTENNAS MARINE AND MOBILE H.F.

### TUNEABLE GROUNDPLANE ANTENNAS SIDE MOUNT DIPOLES

### COAXIAL DIPOLES

### HIGH GAIN ANTENNAS

### DISCONE ANTENNAS

### FIXED FREQUENCY GROUNDPLANE ANTENNAS —

### MOBILE COAXIAL DIPOLES

### UNITY GAIN — (FIBREGLASS) WHIPS

### 4.5 dB GAIN (FIBREGLASS) WHIPS

### PHASED SIDE MOUNT DIPOLES

### VHF-UHF DIRECTIONAL ANTENNAS YAGI

### MAGNABASE — MAGNETIC BASE

### HELICAL WHIPS — 6ft, 8ft, 12ft, 15ft

### PAGING ANTENNA H.F. BALUNS

### ANTENNA MOUNTING HARDWARE

### ACCESSORIES

### FILTERS AND DIPLEXERS PORTABLE

### WHIPS

### H.F. MOBILE WHIPS — 6ft, 8ft, 12ft, 15ft.

### FLEXIBLE, MOBILE WHIPS



**SCALAR**  
**Industries Pty Ltd**  
Communication Antennae Engineers

VICTORIA: 18 Shelley Ave., Kilsyth, Vic., 3137. Ph: 725-9677

Cables: WELKIN, MELBOURNE. Telex: AA34341.

NSW: 20 The Strand, Penrith, NSW., 2222. Ph: 570-1392

QLD: Ph: 371-5677 SA: Ph: 42-6666 WA: Ph: 57-1555

## WIA PUBLICATIONS

The Institute is currently investigating the feasibility of publishing an "Amateur Radio Year Book" for sale to the public through normal commercial outlets. The present procedures for publishing and distributing Amateur Radio magazine have also been reviewed and at this time are considered to be satisfactory as they stand.

(Note by Editor: Any ideas about what the Year Book should contain and anything else relating to it would be most welcome.)

## P AND T DEPARTMENT DISCUSSIONS

The relationship between the WIA and the P and T Department continue to be close and cordial. During the year constructive discussions have been held on such matters as Novice licensing, the Call Book, WARC 79, "CB", repeater licensing conditions, amateur examinations, etc. It was also noted that officers of the P and T Department attended the 1977 Federal Convention (as they have in the past) and many views were freely exchanged.

## OFFICE

Executive office procedures have been reviewed and streamlined wherever possible to achieve maximum efficiency at minimum cost. This question is under constant review.

## FINANCIAL

The Convention passed a motion that the Federal element of the 1978 subscriptions be determined not later than 31st August, 1977. Another motion was passed "That for funding WARC 79 expenses a levy be imposed on each Division at the rate of \$2.00 per member at the time of the 1978 subscriptions invoicing, such sum to be paid prior to 31st March, 1978, by the Divisions in respect of their members". A budget for 1978 was adopted.

## MORE "CB"

A meeting was held in Canberra with the Minister for Posts and Telecommunications, Mr. E. Robinson, during the evening of 27th April. Mr. D. Large, who wrote the report to the Minister on the introduction of a Citizens' Band Service in Australia, attended. On the WIA side were the Federal President, Dr. D.

Wardlaw VK3ADW, Mr. M. J. Owen VK3KI, Mr. T. Mills VK2ZTM, President of the NSW Division, and various members of the NSW Division "CB" Investigating Committee, including Mr. S. Kuhl VK2ZSK, C. Jones VK2DD, and D. Dwyer VK2ZCC. Mr. E. W. Howell VK1TH, also attended.

The Minister was unable to attend his stay at the meeting but discussions with Mr. Large continued.

## WIA PROJECT AUSTRALIS

The Annual Report of the Chairman of the WIA Project Australis Group was received and adopted by the 1977 Federal Convention. Mr. D. J. B. Hull VK3ZDH highlighted several problems in his report but one of the more important of these was the fact that because of other commitments he wished to step down from the role of Australis chairman in order to concentrate what time is available to him to the command station role. We noted that a number of enquiries from some very capable interstate people over the years offered help with the hardware, etc., but could not be taken up because of co-ordination difficulties. Further action relating to this activity was left in the hands of the Executive.

## WICEN

The Federal WICEN Co-ordinators' annual report was very well received at the Convention as it highlighted a number of problems. Many members seemed apprehensive about joining WICEN but in discussions it emerged that the procedures to be learned were simple, minimal and commonsense. Nobody need have any fears of tedious learning before being accepted into WICEN as the message handling procedures were easy to assimilate but more importantly meant that a disciplined back-up service, such as that offered by amateur radio, was more likely to be accepted and used by State emergency service for the benefit of the community as a whole. An undisciplined rabble involved with radio communications was something everybody feared. It was agreed to look into the feasibility of holding a WICEN Co-ordinators' meeting in the near future.

## QSP — continued

### RUSSIAN SIGNALS VEHICLE FOR WIRELESS ELECTRICITY?

OTTAWA (CP) — A communications department official said Tuesday the Soviet Union has sent out since July a series of powerful radio signals that have disrupted communications at various times throughout the world.

The signals have also fuelled speculation that the Soviets are trying to develop a system of transmitting electrical power without wires, a possible solution to global energy troubles.

W. W. Scott, director of the department's operations branch which has been monitoring the Soviet signals, said the experiments prompted a rash of protests, including from Canada, Great Britain, the US and Scandinavian countries, which were particularly affected by the disruptions.

As a result, the Soviets cut back the experiments, "but they had been just going, go, go almost on a continuous basis," Mr. Scott said.

He said there is no evidence about the purpose of the signals, which he called amazing and puzzling. "But you have to keep an open mind. There are so many strange things going on today in science."

Followers of the turn-of-the-century Yugoslavian inventor Nikola Tesla are convinced, however, that the signals are part of a Soviet attempt to transmit electrical energy by using the earth as a conductor, one follower said.

Andrew Michrowski, an Ottawa architect and member of the Planetary Associa-

tion for Clean Energy, an international group trying to resurrect Tesla's work, said the implications of such a system are overwhelming.

Mr. Michrowski said in a telephone interview that Tesla's invention, called a magnifying transmitter, would make it possible to send electric power anywhere in the globe at the speed of light with up to 15 per cent less energy loss than present systems and without costly networks of wires and transmitters.

The technique could also be an efficient means of tapping solar energy, of controlling the world's climate and of enabling plants to grow with less sunlight and water, Mr. Michrowski said. Although the exact effect has not been worked out, it could result in oranges growing in Saskatchewan.

The magnifying transmitter also has enormous potential for destruction if abused or misused, he said. For instance the system could cause earthquakes.

In simplified terms the Tesla system links the generally negative particles of the earth's atmosphere with the generally positive particles of the earth's atmosphere with the generally positive particles in the earth, Mr. Michrowski said.

Tesla is said to have had one of his machines working in northern Quebec and it was used for several years to power a laboratory about 100 miles away, Mr. Michrowski said.

From "The Tribune", Winnipeg, Manitoba, 2-2-77.

Submitted by Frederick Phillips VK2ZQ. ■

## AFTER THOUGHTS

The values given in Table 1 for the article "Transitions in Coaxial Lines" (AR April 77, page 20) and reference No. 1 were incorrect. The correct values are as follows:

D/D <sub>0</sub>	Δ/D <sub>0</sub>	
	50 ohms	75 ohms
1.2	0.055	0.065
1.4	0.105	0.12
1.7	0.165	0.17
2.0	0.215	0.22
2.5	0.29	0.295
3.0	0.35	0.36
3.5	0.415	0.42
4.0	0.475	0.48

## References.

1. SANDORF, H. N., Amateur Radio, 38: 7 (1970). ■

It's warmer up here!

## NORTH QUEENSLAND CONVENTION

TECHNICAL SESSIONS & VISIT  
PANEL DISCUSSIONS  
FOX HUNTS — HOME BREW  
FAMILY ENTERTAINMENT  
23rd, 24th July  
P.O. BOX 964, TOWNSVILLE

# THE EFFECT OF GROUND ON THE DIRECTIONAL PATTERN OF A 14 MHz ANTENNA

A light aeroplane was used to measure the directional pattern of VK3MO's 14 MHz antenna system. Two three element monoband beams are slacked at 30 m (100 ft) and 14 m (45 ft). Field strength measurements were taken in two directions which have differing ground conditions. This allowed an estimate of the effect of the ground conditions on the performance of the system. It was found that the lobe in the preferred direction was 2 S points stronger than the direction with less favourable ground conditions, and this lobe was at one half the angle of radiation.

A. G. Bolton VK5TT,  
and I. J. Williams VK3MO  
3 Illard Street, Vale Park 5261, S.A.

There are considerable advantages for the ham whose antenna has a low angle of radiation. Openings occur sooner for him, and last longer, because he can use the ionosphere which is just coming over the horizon. His neighbour must wait for the ionized region to rise higher above the horizon.

Also, even when the band is open to both hams, the lower angle of radiation means the DX can be reached with fewer ground and ionospheric reflections. Each of these reduce the strength of the signal.

Ground conditions considerably effect the direction of the major lobe of an antenna system. They can reduce the available signal power because of the effects of relativity. Perfect ground, which is a flat ideal conductor, would give greater power to the lobe than a resistive ground. But how much power is lost, and by how much is the angle increased? The direct measurements from the plane were to help find out.

## THEORETICAL PREDICTIONS

The effect that flat resistive ground has on the magnitude of the lobe can be computed theoretically. It has been shown to 'slightly reduce the magnitude of the maxima of the directional pattern of the antenna'. A representative figure for this effect has been given as .1 dB, the sea being .1 dB better than dry earth.<sup>2</sup>

The angle of the directional pattern of the antenna over ground is determined by both the free space pattern of the antenna and the directional characteristics of the ground.<sup>3</sup> It has been suggested that the directivity of the free space pattern does nothing to the vertical angle of the lobe.<sup>3</sup> This would mean a 3 element yagi would have the same angle of radiation as a dipole. However this is not the case. The contributions of the ground and of the antenna are superimposed; it is the product of the two which gives the overall pattern.

The antenna under test has stacked 3 element yagis. The higher yagi is at 30 m (100 ft), and on the 20 metre band this is 1.5 wavelengths. Theoretically, a dipole at this height would have a lobe at 9.6° to the horizontal.

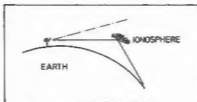


FIG. 1: Openings are longer with Low Angle of Radiation.

## MEASUREMENT TECHNIQUES

A TS520 receiver was taken aboard a light plane which had a 1.5 metre long antenna lead securely between the landing wheels. The S meter of the TS520 was used for the field strength readings, and the antenna under test was energized with a 5 watt carrier signal. Later, a calibration curve for the S meter was obtained using reasonably accurate instruments.

The plane flew at various heights and 2 sets of signal strength readings were taken. In the westerly direction one set was at 3 km from the antenna, and the other set was a 1.5 km. Then the antenna was turned south and the signal strength measurements were repeated, south of the antenna this time at distances of 2.5 km and .8 km.

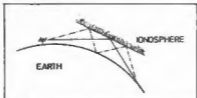


FIG. 2: Fewer Reflections are needed with a Lower Angle of Radiation.

## RESULTS

The directional pattern of the antenna was calculated using the calibration curve for the S meter of the TS520, and by making allowance for the distance of each measurement from the antenna. For the purpose of calculating this distance and the angle of the radiation it was assumed that the emitted radiation was from midway between the stacked 3 element yagis.

Diagram 3 shows the field intensity as a function of the angle of radiation for each of the 4 sets of readings. Diagram 4 shows the terrain in the western direction, and diagram 5 shows the terrain in the southern direction.

## INTERPRETATION OF THE RESULTS

1. The comparison between the readings in the western direction at 3 km and at 1.5 km show the radiation pattern changes even after distances in excess of 50 wavelengths. This suggests that ground conditions at this distance still have an important effect on the performance of an antenna system such as the system under test. It would be reasonable to assume that the ground conditions at these distances would be less important with less directive antenna systems.
2. The angle of radiation of the lower lobe (4 degrees) clearly illustrates the importance of free space antenna directivity on the directivity of the antenna system over real ground. The contribution from the ground alone is at 9.6 degrees to the horizontal.
3. The signal to the west is far stronger than the signal in the southerly direction. There is a 12 dB advantage and it has half the angle of fire. These advantages could be attributed to three factors.
  - (a) The house and garage south of the antenna. These are .5 wavelengths away horizontally, and only .25 wavelengths below the lower beam.
  - (b) The rise to 10 m and 120 m from the antenna in the southern direction. This field also has 20 m high trees on it.
  - (c) The differing soil resistivities. The soil in the preferred direction is volcanic and south of the antenna the soil is sedimentary.

It is difficult to isolate the individual contributions of these three effects. The average rise of the ground south of the antenna is 4° for the first 150 m. This might account for the rise in the angle of fire of the antenna in this direction of approximately 4°. The trees at 150 m are 20 m tall and therefore level with the top

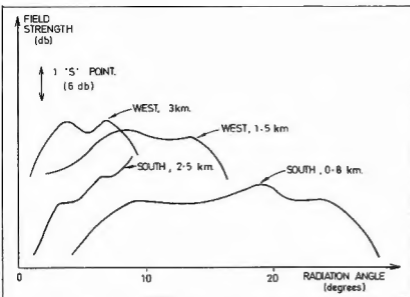


FIG. 3: Results of Field Strength Measurements.

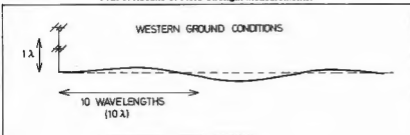


FIG. 4

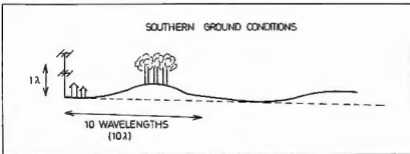


FIG. 5

of the antenna. This might account for the lower power in the lobe, though the antenna pattern would also be modified by the proximity of the house. It seems unlikely that the house would account for a difference of more than 3 dB in signal intensity, since the yagis are fed at the same power level. The resistivity of the soil may also account for a considerable loss in lobe strength, though simple theory suggests otherwise.

One point is clear, level conductive soil is worth at least 2 S points over ground conditions which are still better than most.

#### SUGGESTIONS FOR FURTHER WORK

It was very rewarding to actually measure the field intensities of an antenna system from an aeroplane. There was a wealth of information available. Using this method, for example, it was possible to count no fewer than 10 minor lobes in the direction of fire of the antenna. However there are a few suggestions for those undertaking further work.

Measurements should be taken at a greater distance than 3 km from the antenna. The results obtained in this test were adequate to demonstrate the con-

siderable effect of the ground conditions, but accurate measurements of the final directional pattern must be made much further from the antenna.

The problems involved with using a light plane need careful consideration. We were fortunate to have the enthusiastic support of Mr. Arthur Gloster, Arthur is a foundation member of the Kyneton Aero Club, and is also involved with antenna patterns professionally. This experience helped a great deal in the planning stages.

Do not underestimate the difficulty of flying to a particular point in the sky. The experience of our pilot, Mr. Paul Tetley, includes aerial photography and crop dusting. This is very important if reliable measurements are to be made.

#### CONCLUSIONS

With planning, the use of aeroplanes in antenna measurements is convenient and extremely informative. The measurements made during this test confirmed our worst suspicions that hams already have about the importance of a good location. It remains to show the relative importance of individual factors such as hills, trees, soil resistivity and adjacent buildings. Further measurements to isolate these factors would be invaluable to the ham who is choosing a location.

#### ACKNOWLEDGEMENTS

We are very grateful for the invaluable help of Mr. Arthur Gloster who helped us plan the details of the navigation, antenna installation on the plane and the method of obtaining the measurements.

Also, Mr. Paul Tetley's skill in piloting the plane with sufficient accuracy was essential to obtaining the test results, and we appreciate this contribution.

#### REFERENCES

1. R. E. Terman. Electronic and Radio Engineering (4th edition), pp. 885.
2. QST November 1975, pp. 21. "Pattern Factors for Elevated Horizontal Antennas Over Real Earth." H. K. Land-skov.
3. Radio Handbook (18th edition), pp. 4F

## QSP

#### REPEATERS

A compilation of 2m repeaters within a 60 mile radius of the Empire State Building in New York reveals 97 all told. QST February 77. And we think we have problems here!

#### 7th SEANET CONVENTION

A letter from HB1WR, President of RAST, advises that the 7th Annual SEANET Convention will take place at the Erawan Hotel, Bangkok, from Friday, 18th November, 1977, to Sunday, 20th November. Details, including special tours such as the Festival of Lights and the Elephant round-up at Surin, and forms for attendance are available on application BASE to the Executive office in Toorak. Advice is also given about the SEANET 77 Contests on CW 9/10 July and phone 20/21 August — details available from BM2PK. Visitors to Thailand should note that the importation of communications equipment is forbidden except on prior authorisation from the Royal Thai Government.

# LOOK INTO THE ULTIMATE



**VOX:** Voice — activated mike circuit is built into the TS820. All vox controls up front.

**NOISE BLANKER:** Crystal filter circuit is highly efficient in eliminating pulse noises.

**RF MONITOR:** lets you hear your own transmission. Also useful for adjusting RF processor

**IF SHIFT:** (Pass-band tuning) varies IF passband without changing receive frequency—lets you eliminate unwanted signals. RIT lets you vary receive frequency 5k Hz either side of VFO.

**VERNIER:** Plate tuning control has vernier for fast precise tune-up adjustment.

**HEATER:** lets you turn off tube filaments on receive only. TS820's solid state circuit draws less than most car dash lights.

**DIGITAL READ-OUT.** (Optional) Clear blue readout on receive and transmit. Mixes carrier, VFO and 1st het frequencies.

## THE BREATHTAKING KENWOOD TS-820 PACESETTER HF TRANSCEIVER

You command the band with our Kenwood TS820. Superb phase lock loop circuitry allows highly accurate frequency derivation without introducing spurious signals. You can switch sidebands (USB, LSB, CW) without recalibrating, too!

Kenwood's exclusive FET-based VFO gives high stability under all conditions. If you'd like to know more, just mail the coupon today.

WHEN YOU WANT TO MOVE UP:



TV506: EMTR band converter



SP-520: 80hm external speaker



VFO820: Remote VFO 5.0 - 5.5 MHz



TV502: 2MTR band converter

Contact your nearest Kenwood dealer or Weston Electronics direct



# KENWOOD

MARKETED IN AUSTRALIA BY WESTON ELECTRONICS COMPANY, FOR TRIO KENWOOD CORPORATION, JAPAN. HEAD OFFICE: 2 THE CRESCENT, KINGSGROVE, N.S.W. 2208.

COUPON

CALL SIGN

NAME

ADDRESS

Postcode  
Phone

WECAR1

# AN AUDIO PHASE-SHIFT NETWORK FOR SOLID STATE PHASING SSB

Roger Harrison VK2ZTB  
14 Rosebery Street, Balmalm 2041

While investigating suitable circuits for a solid-state phasing SSB rig I came across an article by Robert Cheek (then W3LOE) in the November 1948 issue of CQ (page 17) entitled "Single Sideband For Everyone". Naturally, it described a valve rig, but it used a passive phase-shift network that not only intrigued me, but exhibited very good characteristics. The circuit was an R-L-C network and is given in figure 1.

It has the advantage of a low-to-medium input impedance and thus may be suitable for solid-state circuitry, together with the unique advantage that the quadrature output ports can drive a low impedance—in the order of 400 to 600 ohms. Just what the doctor ordered for solid-state gear! The sort of audio phase-shift networks popularized at that time involved either active or passive R-C networks. The latter inevitably required very high impedance loads on the quadrature output ports or a stable, well-defined high impedance load. Solvable, but awkward. Active audio phase-shift networks, while attractive for other reasons, do not have the elegant simplicity of the passive networks. Increased circuitry is required and the alignment necessary is a drawback in many circumstances. Besides, I didn't feel like getting into that just yet.

Anyway, however the circuit was going to turn out, I was interested in giving it a go. The original article specified a modified audio transformer for T1 and L1 and a power supply choke for L2. Some modernisation was necessary and so some suitable pot cores were tried. The results of design and adjustment are given in the parts list.

## COMPONENTS:

According to the original article, components are relatively non-critical and standard 5 per cent or 10 per cent types may be used. The main requirement is that each 40 mH inductor must resonate with the 1 uF capacitor at 800 Hz. The exact values appear to be unimportant so long as components of the nominal value specified are used. L2 and the 6.2 nF capacitor must also resonate at 800 Hz. The exact frequency has no particular magic about it, 800 Hz being the geometric mean between 160 Hz and 4000 Hz which adequately covers the speech band. It is sufficient to ensure that each LC circuit resonates to the same frequency. The reactance of each of the 1 uF capacitors and the 40 mH inductors is about 200 ohms at 800 Hz.

Another alternative for the 40 mH inductors would be to use the 88 mH toroids beloved of RTTY enthusiasts. These consist of two 44 mH coils wound on a toroid and connected in series. They can be obtained quite cheaply from local sources or overseas. Using a CRO or VTVM and an audio oscillator it is a simple matter to resonate a 44 mH winding and a 1 uF capacitor to 800 Hz. Remove turns from a 44 mH winding until resonance is achieved. This sort of method may be used regardless of what coils are used.

Locally available toroids may be used to construct T1, L1 and L2 if desired, and details are given in the parts list.

The transformer, T1, consists of two windings connected in series, each having equal numbers of turns wound on the same core and resonated to 800 Hz with the 1 uF capacitor. The dots in figure 1 indicate corresponding ends (start or finish) of each winding.

## CIRCUIT CHARACTERISTICS:

The input impedance is approximately 5K and should be driven either by a transformer, a phase-splitter stage or a differential amplifier. The quadrature output terminals, A and B, can drive a load impedance of around 400 to 600 ohms as mentioned previously, the characteristics of the network being largely unaffected by the actual load impedance—a distinct advantage over passive R-C networks which are quite sensitive to load impedance variations.

The speech amplifier preceding the network needs to include de-emphasis of about 4 dB per octave below 800 Hz as the network has a rising response in this region.

The characteristics of the network, from the original article, are as follows:—It will maintain the 90° phase difference between the output terminals within 2° from 300 Hz to 4 kHz and the amplitudes of the two outputs within about 0.3 dB of each other over the same range. There is a much smaller variation in both parameters between 400 Hz and 3 kHz. Thus, the

opposite sideband suppression that may be obtained is 35 dB at worst at the extremities of the speech band and at least 40 dB across the substantial portion of it. A sharp cutoff above 3 kHz (at least 12 dB per octave) is recommended for the speech amplifier. A similar cutoff below 300 Hz is also recommended.

The network has a midband loss of about 15 dB and thus the speech amplifier needs to have sufficient gain to overcome this loss and provide sufficient output for the following circuitry. Similar comments apply if the network is used in receiver applications.

The low output impedance of the network makes it eminently suitable to drive diode balanced mixers without messy matching problems.

The author's prototype performed much the same as that in the original article.

Well, don't just sit there—get your soldering iron out!

## PARTS:

L1 = 176 turns of 26 B&S enamelled wire on single bobbin of VINKOR LA2330 pot core assembly

Or ~ 93 turns of 38 B&S enamelled wire on NEOSID toroid 12.7 mm OD by 6.35 mm ID by 9.52 mm height of F9 material.

L2 = 2090 turns of 42 SWG enamelled wire on single bobbin of VINKOR LA2330 pot core

Or ~ 7052 turns of 38 B&S enamelled wire on NEOSID toroid 38.1 mm OD by 25.4 mm ID by 19.05 mm height of F9 material.

T1 = Two windings, one on each half of a double bobbin of VINKOR LA2330 pot core, 176 turns of 34 B&S enamelled wire for each winding. The dot indicates the start of each winding.

Or ~ 2 x 93 turns (bifilar) of 38 B&S enamelled wire on NEOSID toroid the same as for L1.

\*The 4.3K resistor, R1, may be a 3.9K in series with a 390 ohm, or 4.7K paralleled by a 56K resistor.

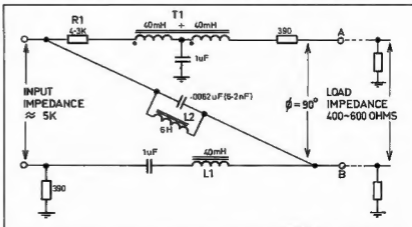


FIG. 1: R-L-C- Audio Phase-Shift Network as described by Robert Cheek in Nov. 1948 issue of CQ.



# EMONA electronics

CBC BANK BLDG., HAYMARKET PHONE: 399 9061  
Room 268/561 GEORGE ST., SYDNEY, NSW 212 4615

MAIL ORDERS: Box K21, Haymarket NSW, 2000, Australia

WRITE, PHONE OR CALL IN!

## INTRODUCING NEW LINEAR AMPLIFIER!

for use with



HF 100L AMPLIFIER

Frequency Range 3.5-30 MHz  
Input Power 100-500 W  
Output Power 100W-500W  
Input Impedance 50 ohm  
Output Impedance 50 ohm  
Current Drain 5 A  
Power Supply 5-30V DC  
Weight 10 kg



YAESU FT 301 Transceiver

30-100MHz, 100W, 100W

WRITE FOR SPECS

## ALSO AVAILABLE:



KENWOOD TS-620 HF TRANSCEIVER

KENWOOD TS-520 HF TRANSCEIVER

KENWOOD TR-7000 2M DIG. TRANSCEIVER

• CHECK OUR STOCK ON OTHER YAESU AND

KENWOOD AMATEUR RADIO EQUIPMENT

ALL AMATEUR RADIO EQUIPMENT IS AVAILABLE ON 10

PER CENT DEP. TO APPROVED BUYERS!

## ALSO: 80w, 144 ~ 148 MHz, FM, SSB LINEAR AMPLIFIER 2M10 - B0L



For use with many new  
all-mode 2 metre transceivers,  
typified by the Kenwood  
TS-700A, TS-700B

- All solid state—microstrip design
- Broadband—requires no tuning across band
- Variable T R delay for SSB/CW operation
- Full VSWR and reverse voltage protection
- Under 1 dB insertion loss in receive or bypass mode
- Harmonics levels typically -40 dB or better
- Measures only 7 1/2 x 10 1/2 x 16 5/8 cm Wt 1 kg

## HAM CLOCK

TIME CLOCK — BATTERY OPERATED — \$28

(P.A.P. inc \$3.50, NSW \$2.50)



## ATTRACTIVE ROOM MATE

CR-102 ALL

FLECTRONIC 12/24

HOUR DIG. CLOCK

AM, FM RADIO

Scoring Brightness,

Volume and Tone

Controls



\$45.95

(P.A.P. inc \$4.50,

NSW \$3.50)

## ALSO AVAILABLE

EMONA E-2, 24 Hour AM/FM Dig. Clock Radio  
EMONA E-4, 24 Hour AM/FM Stereo Dig. Clock Radio  
EMONA DMH-95 (9 Trans.) AM/FM Pocket Radio  
ELCOM Range of Scientific (SC-6010 & SC-44P) and  
Business Calculators  
LAMBDA Six Function, LED-Quartz Dig. Watch  
Car Radios, Car Cassette Players, etc.

# INTERSELL ELECTRONICS PTY. LTD.

## TRANSCEIVERS

- SWAN 700CX — 700 W PEP Input Standard Model 8 Pole filter and also 700CX SS16B with 16 Pole filter P.O.A
- SWAN 300B — 300 W PEP input USB and LSB Xtal cabr with Standard and 16 Pole filter Complete with integral PSU and Speaker \$489.00
- SWAN SS200A — All Solid State 300 W PEP input incl VOX, Noise Blanker, SW Sidelone, Xtal calibr. and complete VSWR protection with special 16 Pole filter \$750.00

## POWER SUPPLIES

- 230XC — Complete with Cabinet and Speaker for 700CX 230X PSU only Both for 240 V AC mains, complete with supply leads and plugs P.O.A
- PS220 for SS200A \$169.00

## WATTMETERS

- WM1500 1.8 MHz to 52 MHz, 0 to 1500 W RMS in 4 ranges 5/50/500/1500 W Large easily read meter with forward power switch and reflected power \$65.00
- PEAK READING WATTMETER — reads PEP and RMS power up to 2000 watts in 3 ranges incl. reflected power \$80.00
- Secondhand FT101 with factory fitted 160MX complete with VFO fan and CW filter Immaculate condition complete with manuals \$450.00

## MICROPHONES

- 444 SHURE desk mikes adjustable height, locking bar with VOX switch facility \$45.00
- 404 SHURE hand mikes — both mikes now in stock again Proven popularity due to specific tailoring for SSB. Both models complete with lead and plug \$35.00

## ANTENNAS

- Two Element TB2HA \$160.00
- Three Element TB3HA \$225.00
- Four Element TB4HA \$290.00
- Solidly made antennas with all elements active on 20/15/10 MX

## MOBILE ANTENNAS

- SLIMLINE 500 W PEP Mobile Antennas with base section, coil and adjustable top whip of stainless steel
- 15MX \$35.00
- 20MX \$40.00
- 40MX \$45.00
- HD Spring \$16.00
- HD Mount \$16.00

## VALVES

- Most Valves for Swan equipment in stock: 8950 6HF5, 6LQ8/6MJ6. Available in matched pairs \$10.00 ea.
- FC76 Digital Freq. Meter Read TX Freq \$175.00

All prices quoted are subject to changes without notice, but are inclusive of Sales Tax. Freight and insurance extra  
SOLE AUSTRALIAN DISTRIBUTORS FOR SWAN AMATEUR AND COMMERCIAL RADIO EQUIPMENT:

**VK2AHK** 3 MIDSON ROAD, OAKVILLE, N.S.W. 2765 — PHONE: (045) 73 6215

# SIMPLIFIED AUDIO FILTERING

Maurie Evered VK3AVO  
13 Sage St. Oakleigh, 3186

If you wish to become an authority on audio filtering or construct a multistage audio filter of well defined characteristics read no further but pass to the adequate list of references at the end of this article. If, however you wish to construct a cheap and simple but very effective audio filtering system to help extract signals from background noise then read on.

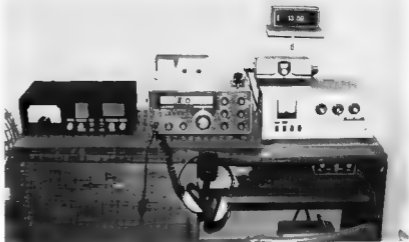
This system was inspired by three other AR articles (references 1, 2 and 3). Experience has shown that you need to be able to apply attenuation to both high or low frequencies depending on background noise conditions and the particular mode being received for example 'high cut' removes excessive background hiss, 'low cut' removes unwanted low frequencies from static or some particular voice characteristics heard on SSB.

The need to apply these principles was accentuated by the ever present background noise at this QTH, a light industrial area with 6 kV power lines about 50 metres from the antenna.

This situation is worsened when you consider the state of the DX bands at present, signals are much weaker than at the sun spot maximum of 1970 or so. The FT101 noise blanker is very effective against 'ignition' type interference but varies in effect against power line noise.

Let us examine briefly the principles we can apply to attenuate unwanted frequencies. I will call these the series and parallel methods. The series method requires inductive reactance (inductance increasing with frequency) and capacitance for low frequency attenuation (capacitance reactance decreasing with frequency).

The parallel method requires capacitance for high frequency attenuation and inductance for low frequency attenuation. This approach was used as the parallel



VK3AVO's NEAT SHACK.

connection of components does not require the opening of any circuit wiring.

The audio filtering was applied in my case to a pair of eight ohm headphones which I always use for listening except when pottering in the shack. This method has the advantage that you do not have to modify your transceiver as all components are added "outboard".

This technique is shown schematically in Fig. 1. You connect either capacity or inductance across the phones to achieve either high cut or low cut as required; leave both disconnected and you have normal receiving conditions. You can mount these components directly onto the phone plug and use a clip to connect to either one (see photograph) or you can build the unit into a box that connects in series between phones and receivers.

The values of capacitance and inductance in Fig 1 were found by trial and error. To achieve the desired results you may have to alter them in any particular



CLOSE-UP OF AUDIO FILTER INSTALLATION.

case. A little experimentation will soon show what values of capacitance and inductance are needed.

In practice I use high cut for an CW and strong local SSB signals, low cut is useful when copying weaker SSB signals with a high static level.

One last word. Do not knock this little filter because of its extreme simplicity, at least not until you have tried it. Anyone visiting my shack is welcome to a demonstration and I think you will be surprised with its effectiveness.

## REFERENCES

1. Improving Loudspeaker Reproduction for SSB Dx. — B. Mann VK3BM AR September 1973 p. 5
2. Improvements to the Loudspeaker Filter. — B. Mann VK3BM and P. Williams VK5NN, AR February 1975 p. 22.
3. Commercial Kinks — R. Fisher VK3OM AR September 1975, p. 25.
4. Filter Designs Part 1 and 2 — Electronics Theory Handbook, p. 12 and 15.
5. ARRL and RSGB Handbooks. — Appropriate Sections.

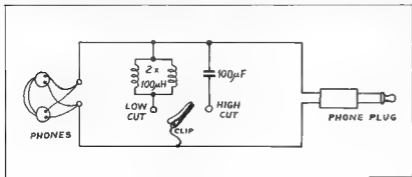


FIG. 1. FILTER CIRCUIT.

# Sideband Electronics Sales

## HF TRANSCEIVERS

**ASTRO** - 200 digital solid state 200 W.P.E.P.

**TRIO KENWOOD** model TS520-D-AC only 10 to 80 M

**TRIO KENWOOD** model 520 AC-DC 10 to 80 M.

**TRIO KENWOOD** model TS-820S AC only 160 to 10 M with digital readout.

**TRIO KENWOOD** model TS-820 AC only 160 to 10 M

**TRIO KENWOOD** model MC-50 Microphone.

**TRIO KENWOOD** model TS - 700 - A FM-AM-

CW-SSB transceivers Full 144-148 MHz coverage, 10-Watt output, VFO controlled, self-contained, AC-DC operation

**TRIO KENWOOD** model TS-600-A FM-AM.

SSB transceiver full 50-54 MHz coverage 10 Watt output variable from 1 Watt to full power.

VFO controlled AC-DC operation. Styling as TS-700-A.

**TRIO KENWOOD** model TR-7400 2 meter FM transceiver 10 to 25 watts output.

Frequency range 144.00 to 147.995 MHz No. of channels 800. Double conversion super-heterodyne sensitivity better than 0.4 UV for 20 DB.

**KYOKUTO** 2 M FM 15 W output transceivers with digital read-out and crystal synthesized PLL circuitry now with 800 transmit and 1000 receive channels 5 KHz apart, covers all of 144-148 MHz, receive to 149 MHz. No more crystals to buy. Includes simplex, repeater and anti-repeater operation.

## NOVICE OPERATORS

All above HF transceivers will be modified for low cost to suit novice. Requirements 27 MHz conv. x-tals in stock now for Kenwood models. **IT IS HERE AGAIN**, the well known SE-501 in new style case 15 Watt pep 23 AM SSB for as low as

Same model with AC built in supply and DC built in SWR power meter and many goodies.

## ICOM

### VHF TRANSCEIVERS SSB

**ICOM** model IC-202 2 M SSB portable transceiver 144-144.4 MHz

**ICOM** model IC-502 6 M SSB portable transceivers 52-53 MHz.

## KLM SOLID STATE POWER AMPLIFIERS

(MHz) 144-148 PA10-80BL 80 OUTPUT (watts)

" PA10-140BL 140 "

" PA10-160BL 160 "

" PA2-70BL 70 "

400-470 PA10-70CL 70 "

**FDK MULTY QUARTZ** with 24 channels 10 sets of crystals supplied 10 Watts, newstyle.

**YAESU MUSEN** model FT 101-E AC-DC transceivers 10 to 160 M with speech processor

P.O.A.

\$590

\$650

\$980

\$850

\$ 49

|||||

P.O.A.

|||||

\$310

\$215

\$260

\$215

\$215

\$265

\$300

**YAESU MUSEN** model FT-301.

**YAESU MUSEN** model FT 301 - D

**YAESU MUSEN** model FT 301 S

**YAESU MUSEN** model FL-2100-BL Ineal Ampl

**YAESU MUSEN** model FP - 301

**YAESU MUSEN** FR 6-7. Uses Wadley loop princ.

## FREQUENCY COUNTERS

**YAESU MUSEN** model YC-500-E-S-J

## HY - GAIN ANTENNAS

14AVQ 10-40M. verticals, 19' tall, no guys

18AVT-WB 10-80 M. verticals, 23' tall no guys

TH3JR 10-15-20 junior 3 el. Yagi 12' boom

TH3MK3 10-15-20 senior 3 el. Yagi 14' boom

TH6DXX 10-15-20 senior 6 el. Yagi 24' boom

HY-QUAD 10-15-20 cubical quad Yagi 8' boom

TIGER ARRAY 204BA 20M4 el. Yagi 26' boom

BN-86 balun for beam purchases only

## MARK MOBILE ANTENNAS

HW-80, 6' long for 80 M.

HW-40, 6' long for 40 M.

HW-20, 6' long for 20 M.

Swivel mounts & chrome-plated springs for all

## CUSH CRAFT ANTENNAS

A144-11 11 Element 2M-Yagi

A147-11 11 Element 2 M Yagi

A147-20 combination horizontal vertical 2 M

A144-20 combination Yagi with matching

harness circular polarization

## ANTENNA ROTATORS

Model CDR Ham-11 for all hf beams except

40 M

Model CDR AR-22 L junior rotator for small

beams

KEN model KR-400 for all medium size hf

beams with internal disc brake

KEN model KR-500 for vertical control of

satellite tracking

All models rotators come complete with 230-

volt AC indicator-control units.

6-conductor cable for

KR-400-500

65 cents per metre

## COAX CABLE CONNECTORS

PL-259

SO-239 Chassi Mount

Male to male joiner

Female to female joiner

Angle connector

T-connector

## COAX CABLE

RG - 8 - U foam filled per metre

## SWR METER

Twin meter model: Y.M. - I.E. 3.5 to 145 MHz

prof quality

**DRAKE TV** - 3300 TV I lowpass filter

SSR 1 Receivers

**CRYSTAL FILTER**, 9 MHz, similar to

FT 200 ones. With carrier crystals.

Soon Available

\$960

\$1140

\$660

\$525

\$185

\$300

P.O.A.

\$ 65

\$ 95

\$160

\$220

\$250

\$250

\$250

\$ 25

\$ 28

\$ 25

\$ 23

\$ 13

\$ 45

\$ 45

\$ 70

\$ 75

\$200

\$ 65

\$110

\$110

\$1.20

\$1.20

\$1.20

\$1.20

\$1.70

\$2.00

\$1.20

\$28

\$ 31

\$270

All prices quoted are net SYDNEY, N.S.W., on cash-with-order basis, sales tax included in all cases, but subject to changes without prior notice. ALL-RISK INSURANCE from now on free with all orders over \$100, small orders add 50c for insurance. Allow for freight, postage or carriage, excess remitted will be refunded

# Sideband Electronics Sales

For personal attention: 24 KURRI STREET, LOFTUS

P.O. BOX 184, SUTHERLAND, 2232

OPEN ON SATURDAYS TILL 12 NOON

TELEPHONE: 521 7573

PETER SCHULZ, VK2ZXL

Amateur Radio June 1977 Page 13

Reprinted and translated from consecutive issues of "Amator Radio" — Published by the Norwegian Radio Relay League (commencing from A.R. No. 5, 1972)

## PART 5 MORE ON AN RTTY CONVERTER WITH ACTIVE FILTERS

The diagrams referred to in this article are the same as those published on pages 11-14 of last month's issue of AR.

The description of the DJ6HP system is concluded in this article.

As in the circuit shown in Fig. 2 the converter shown in Fig. 6 has a capacitor added in parallel with the feedback resistance  $R_R$  ( $R_{11}$ ), thus causing the circuit to have a low pass filter characteristic.

For the added in Fig. 2 the following applies:

$$-U_a = \frac{R_R}{R_{e1}} \cdot U_{e1} + \frac{R_R}{R_{e2}} \cdot U_{e2} \quad (7)$$

The time constant which the parallel capacitor causes has the value . . .

$$T = R_R \cdot C \quad (8)$$

You can therefore find the boundary frequencies for the circuit.

$$f_{\max} = \frac{1}{2 \cdot \pi \cdot R_R \cdot C} \quad (9)$$

If the two input voltage swings are nearly equal you get at the output an alternating voltage swinging about 0 with a maximum frequency determined by T. For RTTY amateurs, you set  $f_{\max}$  to 40-50 Hz such that you can be sure that the signal will pass the filter.

After the low pass filter follows a non-inverting Schmitt trigger which is also made with the aid of an operational amplifier. This is shown separately in Fig. 4(a). The input and output waveforms are shown in Fig. 4(b).

For this circuit, the following apply (refer to Fig. 4(b)):

Switch on level . . .

$$U_{ePA} = -(R/R_R) \cdot U_{amin} \quad (10)$$

Switch off level . . .

$$U_{eAV} = -(R/R_R) \cdot U_{amax} \quad (11)$$

Coupling hysteresis . . .

$$U_e = (R/R_R) \cdot (U_{emax} - U_{emin}) \quad (12)$$

For a large input voltage  $U_e$  becomes  $U_a - U_{amax}$  if you lessen  $U_e$ ,  $U_a$  will remain at the value  $U_{amax}$  until  $U_e$  reaches value  $U_{eoff}$ . At this time  $U_a$  jumps to  $U_{amin}$ . This switching action is started by  $U_e$ , but thereafter it is decided by the coupling of  $R_R$ .

The stable value  $U_{amin}$  is maintained until  $U_e$  exceeds the value  $U_{eon}$ . In

Fig. 4(b) is shown the input and output voltage waveforms. For a supply voltage of  $\pm 15$  volts for IC type 709  $U_a$  max will be about 12-14 volts,  $U_{amin}$  about -12 to -14 volts.

The following transistor T1 (5) acts as an inverter. It is coupled in or bypassed depending on whether normal or reverse shift is required, i.e. a higher or lower tone frequency could represent a mark frequency signal.

Transistor T2 is the keying transistor for the magnet current to the teleprinter. Here the current is supplied to the magnet through a variable resistance. The second magnet lead is coupled to earth through T2.

Transistor T2 must be able to break and close a supply voltage of 200 volts. (Alternatively a constant current low voltage driver could be used. Refer to AR Vol. 44, No. 3, March 1976, p. 7.—Ed.)

### RTTY CONVERTER COUPLING

Operational amplifiers OP5 and OP7 in Fig. 5 are connected between the receiver low frequency output and the converter's diode input K (Fig. 6) and operate as additional active selection circuits with an amplification factor of about 25. OP6 lets 1050 Hz signal through). A 3 dB bandwidth of 50 Hz is chosen so that the slot keying impulses of 20m sec can swing fully and reach the maximum amplitude.

OP7 works in the same way at the same bandwidth, but here three preset shift frequencies can be selected by means of S1.

P14 is a 10 turn potentiometer and with the aid of this you can in position 1 cover a shift range from 0 to 1000 Hz continuously. P14 and P4 may be omitted if you limit yourself to fixed shifts.

At point K the signals are brought together and passed to the diode limiter at the input of OP1 and at the output of this they appear with a constant amplitude of about 25 volts peak to peak.

By using P1 and P2, Fig. 6, the input level for the resonant circuits OP2 and OP3 may be adjusted so that at the outputs MP4 and MP5 (after resonance adjustment) always appears as 8 volts peak to peak. Amplification factor for both circuits is about 0.5.

All other values match those for OP6 and OP7. If you use variable shift-adjustment, it is recommended that P4 and P14 be mechanically coupled to enable operation of both selection circuits together so that they "track" together. Otherwise you adjust P4 first and then set P14 on the same scale adjustment.

The signal which is rectified by D3 and D4 goes into an active low pass filter OP4 where the limit frequency is again chosen such that the short key impulses increase to full amplitude.

The following Schmitt trigger has, with the stated resistance combination, a hysteresis of about 0.8 volts. You can also make the hysteresis variable by putting in a potentiometer of 500k ohm as  $R_R$  (R15). This potentiometer must be limited to a minimum value of 50k ohm. The circuit hysteresis can be altered between 2.5 and 0.25 volts.

You can also wire OP5 as a comparator (change over plus and minus inputs and omit R15). It has been found advantageous to have hysteresis, otherwise OP5 will couple in with the weakest noise signals and the teleprinter will type nonsense.

The circuitry for T1 and T2 needs no further explanation. S2 takes care of switching from "normal" to "reverse" shift. S3 switches to "stand-by".

### ADJUSTMENT OF THE CONVERTER

Necessary equipment—tone generator and oscilloscope.

(1) Remove D3 and D4. Select the lowest DC range on the oscilloscope and adjust the zero point on the screen when the probe is earthed. The probe is the set on MP8 and you adjust P9 till the scope reads 0 volts.

D3 and D4 are soldered in place.

(2) Point K is uncoupled from the rest of the converter. You set the scope to MP3 and adjust to zero reading by means of P8 (fairly critically).

(3) You supply to point K a signal of 1050 Hz and about 1 volt peak to peak. The probe is set to MP4, the output voltage adjusted to maximum with P3.

Then the voltage on MP4 is adjusted to 8 volt p/p by means of P1.

(4) You connect to point K a signal of 120 Hz and about 1 volt p/p. Probe is set to MP5; output voltage set to maximum by means of P5. Then set the voltage of MP5 to 8 volts p/p by means of P2.

(5) Connect to point K a signal of 1475 Hz at 1 volt p/p. Voltage at MP5 is set to maximum by means of P6.

(6) Connect to point K a 1 volt p/p 1900 Hz signal. Voltage at MP5 is set to maximum by means of P7 (S1 must naturally in each case be at the right setting).

(7) Point K is reconnected to the rest of the converter.

(8) You connect to the input of the converter a signal of 0.1-0.2 volt p/p and frequency of 1050 Hz. The oscilloscope probe is connected to MP1. MP1 is adjusted to maximum voltage by means of P10.

(9) Repeat the same procedure at MP2 with P11, P12, and P13 with 1220 Hz, 1475 Hz and 1900 Hz as in instructions 2, 3, and 4.

(10) Disconnect X deflection of the oscilloscope. Points X and Y are joined to the corresponding X and Y inputs of the oscilloscope. The Y amplifier is adjusted to 0.5 volt/cm and X amplifier to the same value.

**COMPONENT LIST FOR FIGURES 5 AND 6**  
OP1, OP5: 709 (without phase compensation see Fig. 6(a))

OP2, OP3, OP6, OP7: 709 (with phase compensation, as shown in Fig. 6(c)), or 741 wired as in Fig. 6(b)).

OP4: 709 with phase compensation or 741. See Fig. 6(c))

D1-D6: Si-diode IN914.

T1, BC107 or similar.

T2: NPN transistor for 250V breakdown or similar.

P1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13: Carbon (trimmer) potentiometer 0.25W.

P4, 14: Wire wound 10-turn potentiometer (Beckmann, Helipot or similar).

R1-R18: 0.25W.

R19: 1W

R2, R29: 1% tolerance

C1-C6: 30V.

C7: —400V.

## BUILDING AND OPERATION OF THE CONVERTER

The construction of the apparatus and selection of components is not critical; you can use parts easily obtainable on the market. (Refer to the WIA disposals lists and the advertisers in this magazine.) The capacitors in the resonant circuits are not critical. It is not necessary to use teflex capacitors. The resistances in the prototype have 5% tolerance. The apparatus is completely reproducible.

It is essential that the received signals and the station receiver must be extremely frequency-stable when the converter works as "two circuits" (AM reception) and with a bandwidth of 50 Hz. It will only show its advantages when the signals are maintained between these limits. If you want to operate surely over 10 minutes, the maximum allowable frequency drift is 25 Hz in any amateur band. Fortunately the higher frequencies usually come from mixing the VFO signals with signals from crystal oscillators, so that the stability requirements given here are realistic for good operation.

The converter compares favourably with the ST5 and ST6 systems. In the presence of QRM signals will usually be received more accurately with this converter. With this type of test you get a lessening of printing errors in proportion 2 to 3 provided the above-mentioned stability needs are met.

The measurements are necessarily subjective but there are no norms which can give objective results.

Therefore I will not commit myself to the given typing error improvements as this will require the same measurement conditions.

In connection with typing errors because of fading disturbances, the converter described will be equally useful as the

ST5 and ST6 when you use the same principle to counteract this.

On the other hand, the performance of the ST5 and ST6 will fall sharply in comparison to the converter described where QRM from strong carrier waves is concerned.

Finally, it should be noted that this converter can neither perform miracles nor conjuring. ■

**TELETYPEs, Repairs, Changeover Mechanisms, Spares, Paper Rolls and Tape, MACHINES FOR SALE**  
**Network Engineering, 492 Jones St., Ultimo, N.S.W. 2007. Phone (02) 211-4630.**

## MAGAZINE INDEX

Syd Clark, VK3ASC

### BREAK-IN October 1976

History and Highlights of New Zealand Amateur Radio, The Zeddi Keyer: A Controlled Hot-Me-Upper for Your Crystal, Power Input Measurements for the Argonaut and Triton.

### CG August 1976

KC4NI Navassa Island 1974; Logic Probes, A Simple One, The Two Metre Fishing Pole: Victory at Sea; Heathkit SB-614 (Review), Another S/S Wire Antenna for 2 Metres, Reactivity in the Ham Shack, A Fine Standing Crane-Up Tower for \$30.

### October/November 1976

Destination Agalaga, A Modular Linear Amplifier, An Interim Ten; Long, Long Dipos; Try This for Selectivity, Heathkit HR-1690 Receiver (Review); Sleuthing the Russian Weather Satellite.

### HAM RADIO September 1976

Two-Metre Transceiver, Digital Frequency Readout for Transceivers, Solid State Morse Keyboard; VHF Dummy Load, Hand Held Calculators: Solving Radio Problems: Automatic Beeper for Station Control; Turn-off Time for Portable Equipment, Audio Frequency Shift Keyer; Calibration of AC Meter Scales; 10 amp. Voltage Regulator, Cleaning Circuit, Generator, Circuits: Trouble Shooting Transistor Circuits; Micro processors.

### November 1976

Wideband RF Auto transformers, Audio Filters for SSB and CW Reception; Very Low Frequency Receiving Converter, Electronic Bias Switch for Negatively-biased Power Amplifiers, RTTY Test-meister, Generator, Practical Crystal Filter Design, Using Your Pocket Calculator for Transmission Line Calculations, Power Supply Servicing, Binaural Synthesizer Filter; Calculating Line of Sight Distances; Microprocessors.

### QST August 1976

Meet the Microprocessor, Part 1 of 3: Another Look at Reflections, Pt. 2; An RF Sensed Antenna Changeover Key Designing Smith's Vertical Antennas, That's a Big 12 Volts, A Unique Digital Mixer, Rid Your Model 28 TD of Distortion Loops via Diploids, Analysis and Discussion: One Step Drops, Once Upon a Time, Radio Fox-hunting in Europe: Put the Ham in the Closet, The Value of Special-Events Stations.

### October 1976

Radio Astronomy, An Inexpensive Sweep Frequency Generator Sync the Desktop: Learning to Work with Integrated Circuits, Pt. 2; The Clock with a New Twist, Meet the Microprocessor, Part 3: A Low Cost Touch-Tone Encoder OSCAR Medical Data, A West Coast VHF DX Expedition, Public Relations, An Emergency Coordinator's View: ARRL Board Plans, On Space Strength Evaluation, QSL's, QSL's, The Flip Side: Amateur Radio in Action, Terra Luna para Colombia.

### November 1976

SSV Image Processing, A Side Mount Rotator for a Large HF Array; The Synthesizer: The VFO Frequency Divider; For Accuracy, Go West: Stone, The Clock, Your Repeater; The Up's Duckling; A General Purpose Audio Amplifier;

Radio Fox-hunting in Europe, Pt. 2, A Tip of the Hat, Worked All States, 144 MHz, Novices Extend Age Horizons, The Oscalocator, A Call to Arms; Great Britain Interference Survey, From Whence Came Ham Tulp T me for Amateurs, and the President.

### RADIO COMMUNICATION October 1976

A Fats Line, PA for 450 MHz, Practical Design for a Capacity Hat Loaded 14 MHz Mri-Quad; Learning about Logic, Pt. 5.

### November 1976

Time-out and Time-out Indicator for the IC22A, An Economy VHF D P Meter, Learning about Logic, Pt. 6; The Heathkit HW-8 Low Power Transceiver (Review), Yaesu FTY 450B 75 MHz Transceiver (Review).

### December 1976

Some Experiments with High Frequency Ladder Crystal Filters, Low Pass Filters (Summary), A Receiver for 144 MHz, The FDX M.U.I.U.I. (Review), Scopex 45-8 Single Beam Cathode Oscilloscope (Review), Tropospheric Disturbances to VHF Radio Signals.

### BREAK-IN January/February 1977

University of Canterbury Electric Town Car Wind Generator Field Controller and motor, Resonant Chokes for VHF, Tuning Ratios: Power Supply for Solid State Transceiver The Fred Dagg Special; Using Hydraulics for Lifting Towers.

### QQ April 1977

Jungle Flea Power, The Mlen 8073 Antenna Bridge, Heathkit SB-300 1 kW Conduct on Good Linear; The Palomar Engineers R-X Noise Bridge, Slow Scan Television Overview 77, Pt. 3: The Multi-band Trap Antenna, Pt. 3: Broadcasters Threaten Take-over of Amateur ULP Band at WARC 76.

### RADIO COMMUNICATION March 1977

A Third Method SSB Generation, Modifying 120/128 Line SSTV Equipment to Transmit and Receive 240/256 Line Video Monitoring for Aural Propagation; The Yaesu FRG7 Receiver RTTY Beginners' Terminal Unit.

### SHORT WAVE MAGAZINE January 1977

Digital Electronic Keyer Transceiver for Eight Metres, Transmitting Antennas for Small Gardens, Voice Noise Suppressor for Mobile Operation (Morris 1000).

### 73 January 1977

SSTV Test Program: How Does Your Rig Perform, Art and the PC Board The New 88 Channel, C-22: A No Hands Telephone Dialer, What's the Best Antenna for 160, Ten Metres Dead or Alive 200 is Good, Weather Satellite S/S Monitor An Automatic Thermal Mod for the Heathkit 10-12 Scope, The UFO Connection, Go North and Mu-10: How to Find a Forgetful Memory, A Super Log, Short on Memory, A Software Replacement for the Mullin Fan, 1000 WPM Morse Code Typist, It Works the First Time, The New Improved TD Decoder Updated, The Re-entry Changers, Repeaters: A New Scaled, A VFO for Sidebanders (Reprint from ARI), Practical Solar Power, A Simple RC Substitution Box, The Competition Audio Driver, The Junk Box as an Art Form The Mod Squad Goes 220, Double Sideband Something New? Carbone Your Crystal, How Does SSB Really Stack Up, Son of the Vertical Wire Antenna, Antenna Switch: The Beeper Ham Phone Answering Service, Dear Good Buddy, SWR Miter Exploded Again, Dirt Cheap Regulator or a Very Pocket QRP Rig, So You Can't Solder or Weld, Fixing Your New Touchtone IC, Revisiting the CD, The Mighty Magnet Mount Antenna, A 15.75 kHz Oscillator, Behaviour Mod for the HM-102.

## QSP

### RECIPROCAL OPERATING

February 77 QST contains a short article reporting that the Soviet Union's IARU Society RSF announced that foreign amateurs might operate in the Soviet Union under a permit good for the thousands of club stations there, and possibly some individual stations. Applications must be made well in advance, through your local IARU Society (the WIA), giving a mass of information about your itinerary, etc.



## NEW PRODUCTS

VICOM has pleasure in introducing the HAL range of products to Australia. The month we detail the KSR 3000 RTTY terminal which handles both ASCII (3 level) and Baudot code, switchable from the front panel. The terminal uses the powerful 8080A micro processor family of integrated circuits to achieve full cursor positioning and editing facility, display up to 1152 characters and nine viewport capability. The terminal accepts demodulated signals and provides a composite video signal to the video monitor. The KSR 3000 is a semiconducting model with full keyboard and parallel bond speeds of 60,80,75,100 and 132 wpm. Incoming data is normally written from the top line of the display down. After the bottom line on the page has been filled, the page scrolls up and the new data is entered on the bottom line. On transmit options modes are switchable.

1. CONTINUOUS TRANSMISSION MODE: data is entered into the 256 character buffer and transmitted as soon as the key is pressed.
2. WORD TRANSMISSION MODE: Data is displayed as soon as a key is pressed but is transmitted only when a character following a space is typed. This allows for individual word editing by backspacing and re-typing.
3. LINE TRANSMISSION MODE: Data is entered into the buffer and held until the RETURN key is pressed. This entire line can be typed and edited before transmission. The cursor can be moved to any position on the page and the necessary changes made.

The terminal also features "word wrap-around". If a word extends past the end of the line, this prevents splitting of a word at the end of a line by the automatic line advance. Another feature - "blank fill" allows for transmission of blank codes whenever the output buffer is empty. This keeps the receiving terminal running at full speed even though the typing speed might be less than full speed.

WRITE (SENDING SAT) FOR COMPLETE SPECIFICATIONS

VICOM CONTINUES TO BRING THE AMATEURS OF AUSTRALIA THE LATEST IN TECHNOLOGY

Manufactured by:

HAL Communications Corp.



THE HAL KSR 3000 RTTY TERMINAL

VICOM CONTINUES TO BRING THE AMATEURS OF AUSTRALIA THE LATEST IN TECHNOLOGY.



THE MOST POPULAR FM PORTABLE!

The IC215 is the take-anywhere 2m fm portable which puts good times on the go. Change vehicles, climb a hill, take it to the boat. The ICOM quality communications go right along with you. Features fully co-axial antenna with optional "rubby duck" 15 channels, dual power (3w/400mw) crystals are the same as the C22 series. Your new IC215 comes complete with mic, carry strap, dry cell, plug, English manual. VICOM 90 day warranty and three popular channels, Price \$199. Rubby Duck antennas \$13.

IC202 2M SSB portable transceiver \$219  
IC502 5M SSB portable transceiver \$219  
ICP35 matching power supply \$116

**PORTABLES**



IC-211



NEW! IC-245 \$479

ICOM 2 M MULTIMODE  
IC211 ac/dc, ssb/fm/cw, digital,  
\$795

IC245 synthesised, digital readout  
- optional ssb adapter

A licence is required for all transmitting equipment.



STATE-OF-

THE-ART

FROM

ATLAS

RADIO



ATLAS 210x/215x



ATLAS 350-XL

The IC225 Australian model is a PLL synthesised rig with PROM for frequencies 145 - 148MHz. Superhet, duplex or duplex receiver is achieved by a flip of a switch on the front panel. This fabulous rig features ceramic discriminator, IOD electronic rx/tx switch, full over protection and VICOM 90 day warranty. Your new IC225 comes complete with mic, mobile mounting bracket, plugs and dc cables. Matrix is factory pre-programmed for WIA bandplan, simplex and duplex channels and a supply of spare diodes for prism channels is provided. Price \$269 (freight extra).

GENERAL

SEMICONDUCTOR COMPLEMENT

TRANSISTORS	34
FET	7
IC	13

DIODES 33 to 128 depending on channels

FREQUENCY RANGE (Per Specification)

VOLTAGE

CURRENT REQUIRED TX

RX

SIZE

WEIGHT

ANTENNA IMPEDANCE

NUMBER OF CHANNELS

FREQUENCY CONTROL

TRANSMITTER

POWER OUT

MODULATION WIDTH

MICROPHONE IMPEDANCE

SPURIOUS LEVEL

RECEIVER

MODULATION ACCEPTANCE

TYPE

RECEIVER SENSITIVITY

1 Microvolt S+N/M

SPURIOUS RESPONSE

BANDPASS

SCOUTCH SENSITIVITY

AUDIO OUTPUT

7

13

13

13

13

13

13

13

13

13

13

13

13

13

13

13

13

13

13

13

13

13

13

13

13

13

13

13

13

13

13

13

**IC225**

145 148 MHz

12.8 VDC NEGATIVE GROUND

2 AMP @ 10 W 0.9 A at 1 W

700 MA AT MAX AUDIO

400 MA SQUELCH D

58 MM (H) x 156 MM (W) x 218 MM (D)

1.9 KILOGRAMS

50 OHMS

23 Channels selected from the Australian 20 KHz

band plan

Stabilized Master oscillator PLL programmed

by diode matrix

10 WATTS or 1 WATT, Selectable

5 KHz

500 OHMS

LOWER THAN 50 DB Below carrier

16F3

DOUBLE SUPERHET, 1st IF: 10.7 MHz,

2nd IF: 455 KHz

4 DB BELOW 1 UV OR LOWER L4 micro V/

30 DB OR BETTER S+N/M

80 DB OR MORE ATTENUATION

+7.5 KHz, +1.5 KHz/40 DB

-8 DB BELOW 1 MicroV

1.5 watts or more into 8 OHMS

VICOM the communication specialists

# COMMERCIAL KINKS

Ron Fisher, VK3OM

3 Fairview Ave.,  
Glen Waverley, 3150

This month a couple of handy hints, one for the ICOM IC 21A and the other a simple improvement to the popular Yaesu FRG-7 receiver.

## THE IC-21A

Over the years this transceiver has proved to be extremely reliable. The one I use was one of the first sold in this country and has run up many hundreds of hours of use, completely trouble free, except for the dial and indicator lamps. They burnt out in the following order: S meter, discriminator meter, receive indicator, and finally the main channel indicator. The transmit indicator is still going. Its life will depend on how much you talk. Enough to say that if you are an IC-21A owner it is worth having a couple of spare lamps on hand, they are easily obtainable from VICOM in Melbourne. In general they are easy to replace except for the main channel selector. More on this one soon. All connections go to a tag strip just to the centre of the S meter behind the sub front panel. Do not try to unsolder an individual connection—cut it off with a pair of small side cutters as close to the soldered joint as you can. It seems that all the leads were twisted together originally, so of course trying to remove one will result in quite a mess.

To replace the channel indicator lamp it is necessary to remove the front panel. Proceed as follows. Disconnect antenna mic and power cables. Invert the set and remove the bottom plate. Now remove the cabinet. Remove the eight knobs plus the plastic washers behind seven of them. The front panel is held by four Philips head screws, one in each corner going from the sub front panel back into mouldings on the rear of the front panel. It will now come away but held to the main chassis with the connecting leads to the power and other switches. There is enough length on these to separate the panel and so gain access to the lamp. Next remove the black painted metal mask that surrounds the discriminator meter. This is held by two screws. You can now remove the discriminator meter and the two light baffles held by the meter mounting bolts. Be careful not to lose the two small nuts at the rear. Now with the meter out, the globe can be pulled from its grommet and replaced. Carefully retrace all the above steps.

All other lamps can be replaced with the removal of the cabinet only.

## THE FRG-7

Having just acquired a Yaesu FRG-7 receiver I have been looking to see if any small improvements can be made. Over the next few months I hope to come up with a few more. One of the first things

noticed with the FRG-7 is that it is very difficult to read the S meter. The illumination of this depends on light reflecting from the main kHz dial. Unfortunately as the meter is set well forward of these lamps the scheme does not work, and so the meter face is in a shadow. Remedy: obtain one of the miniature 12 volt lamps with leads attached and secure it above the meter with a spot of contact adhesive. Take the leads to the three lug strip above the chassis just to the rear of the main dial. Modification complete, and the meter will now stand out like a searchlight. ■

# IARU NEWS

## PRESENTATIONS

At the 1977 Federal Convention in Melbourne Mr. M. J. Owen VK3KI, one of the four Directors of the IARU Region 3 Association, presented an engraved plaque to Mr. P. D. Williams VK3IZ in recognition of Peter's role in the establishment and early years of the Association. Mr. Owen also presented a very handsome medallion to the Federal President of the WIA from the Philippines Amateur Radio Association (PARA).

In speaking to the Federal Council Mr. Owen, as IARU liaison officer of the WIA, said he would be attending an IARU International Working Group meeting in the UK during June as part of his duties in the IARU. The IWG would be preparing material at different levels for use by IARU Societies in their approaches to their Administration for WARC 79. He referred to problems expected to arise in connection with amateur geostationary satellites for which a technical paper was required, as an example of the upper levels of sophistication.

Amateur radio is now entering the pre-WARC 79 period of increasing activities to detect and define the areas of frequency clashes. The IARU had accepted the role of co-ordinating and assisting societies, especially the smaller societies, towards influencing their Administrations. In the larger countries, WARC 79 work was well advanced and their experience would be valuable in identifying the problem areas. Much work and many difficulties lay ahead, not least being the comparative dearth of accomplished experts in the Region for so vast a project as WARC 79.

Next year, said Mr. Owen, would see the third Region 3 Convention to be held in Bangkok. The WIA would need to consider representation by two delegates for various reasons, particularly relating to WARC 79 the following year. During the year the President of IARU, Noel Eaton VESGJ, would be embarking on a world tour as a contribution towards societies' work for WARC 79. Various problems with the IARU Region 3 Association's Constitution also required to be tackled. In considering WARC 79 some preliminary assessments were made relating to air fares to Geneva, accommodation expenses and the fact that hotel bookings at so large

an international gathering would be difficult to obtain. The WIA was hopeful that an Institute delegate would be included in the Australian delegation. Work on this was proceeding. It was most pleasing to report the very large voluntary contribution being made towards the upkeep of the Region 3 Association by Japan, and Mr. Owen paid tribute to the work of the Association's Secretary, Mr. David Rankin 9V1RH/VK3QV.

Federal Council expressed thanks to Mr. Owen for his report and work in IARU and recorded appreciation for the work being undertaken by IARU President Noel Eaton.

The Federal President advised that so far very little feedback had derived from the last APG meeting at which the frequency requirements for all services had been submitted. Mr. Owen asked that thought should be given to fill-back positions and the necessity to consider details relative to the three new bands of 10, 18 and 24 MHz proposed for the amateur service. The order of merit of the various options must always be kept in mind. More information was required in respect of amateur work in the microwave region.

It is refreshing to record in this day and age the enormous amount of valuable work being carried out by the IARU for WARC 79 in contrast to the almost negligible contribution, so far as the WIA was concerned, prior to WARC 1959. Judging the IARU co-ordination role alone the amateur service is unlikely to lose much at WARC 79 by default or inattention to detail. ■

# LETTERS TO THE EDITOR

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the publishers.

The Editor,

Dear Sir,

Have just received a copy of February my AR and noted the segment "Notes from IARU" on page 3.

I am afraid that the segment contained an error of fact in it concerning the number of Societies in Region III. The correct figures are —

No. of known Societies within Region III, 17; No. of Region III Societies also members of IARU, 15; No. of Region III Societies members of Region III Association, 12.

The AR item stated that there were only 9 IARU member societies in Region III. This is not correct — there are 15.

The other comments concerning countries having no amateur society are unfortunately correct and it is particularly distressing to note that the following countries in this category are also known to be active in ITU affairs —

Afghanistan, Bangladesh, People's Republic of China, Iran, North Korea, Laos.

There is virtually no amateur radio in any of these countries except Iran and so

it is cause for great concern — which way will these countries vote at WARC 1979 as it seems highly likely that they will have delegations in attendance at Geneva.

David Rankin 9V1RH/VK3QV,  
Secretary IARU, Region 3.

The Editor,  
Dear Sir,

May I, through your pages, thank all those many kind Amateurs who have shown such deep sympathy to myself and our family in the loss of my husband, Ron VK3AKC.

It made us very proud that so many people really cared.

To Ron, being an Amateur was not just a hobby — it was a way of life. I don't think anyone else could have got more pleasure out of every phase of it. He appreciated every contact on the air and was even more pleased if he could follow that up with an "eyeball QSO". No one appreciated more than he that the saying "No man is an island", is doubly true in Amateur Radio, and he was always very sincere in his acknowledgement and gratitude for the very many Hams who were always willing to help him in every way they could.

He has often said that, without them, he could not have done the things he has done.

We, his family, thank you, too, for making his Amateur life such a rewarding one for him and we thank you for helping us to bear our very heavy loss.

Mary Wilkinson.

The Editor,  
Dear Sir,  
**NOVICE LICENCE SYLLABUS**  
What are you trying to do — destroy the Novice concept?

This was my first reaction as I started reading page 24 of April AR. For the most part no indication of treatment depth is indicated, although part way through some qualifying notes appear, e.g. — "elementary facts only for Novices", so a "judgement" is difficult to make.

The point I want to make is — let's not get carried away with ecclesiasticism. At the AOCPL level we are not trying to train people to become engineers it is after all only a hobby — albeit a technical one. How much more must this thought apply to the Novice level.

A prospective Novice operator is confronted with the proposed syllabus (I believe there is a good chance he will throw up his arms in despair and then be attracted to the ranks of the CB Pirates).

Enthusiasm for the preparation of a syllabus and subsequent writing of a course should be tempered by realism with the ultimate objective in view. That objective, of course, is the attainment of a licence.

For the five years ending 1975 I conducted the VK AOCPL class under the auspices of the Department of Further Education. I had a break last year, but am back with it again this year. The course runs for two terms, one night per week from 7.30 p.m. (about 26 weeks total), finishing just before the August AOCPL exam (we begin studying a Novice course in May for the November Novice exam).

The students don't complete the course knowing all there is to know about amateur radio, but then who does? However, most of them pass at the exam they are satisfied and I am gratified — getting them into what counts.

The above is not intended to be a criticism of the efforts of others, just a view of things from a different perspective and I trust will be received as such. Comments were asked for — I am anxious to get licensed amateurs on the air.

M R Barford VK3ZQ

The Editor,  
Dear Sir,  
Since 1936, some short time contacts have been made for the worked All Continents Award, all without prior arrangement or sheds. First was in 1936 in 50 minutes operating on 14 MHz CW, followed on 6-2-48 in 28 minutes on 14 MHz AM. From here on WAC many times in under the hour, but the best times were in 14 minutes on 22-2-72, 14 MHz SSB, and in 11 minutes on 5-7-73, all 14 MHz SSB.

I have been unable to ascertain from the USA if these times have been bettered, and would like to know if any VK stations have made WAC in a lesser time. Prior to 1964 power was 50 watts input and later 200 watt s.

VK4DO

Try and beat this. — Eds.

# VHF-HF AN EXPANDING WORLD

Eric Jamieson, VK5LP

Farmonston, 5235

## AMATEUR BAND HEADINGS

VK0	VK0MA, Newcom	83,100
VK1	VK1RTA, Canberra	144,475
VK2	VK2WV, Sydney	82,450
VK3	VK3WT, Sydney	144,810
VK3	VK3RTG, Vermont	144,700
VK4	VK4RTL, Townsville	82,800
VK4	VK4NTT, Mt. Newbould	144,400
VK4	VK4RM, Brisbane	432,490
VK5	VK5VF, Mt. Lofy	55,000
VK5	VK5VF, Mt. Lofy	144,900
VK6	VK6RTU, Perth	82,800
VK6	VK6RTU, Kalgoorlie	82,350
VK6	VK6RTW, Albany	82,950
VK6	VK6RTW, Albany	144,500
VK6	VK6RTU, Perth	145,800
VK7	VK7RMT, Launceston	82,400
VK7	VK7RTX, Lonsdale	144,900
VK8	VK8VF, Benalla	432,475
VK8	VK8VF, Benalla	82,250
3D	3D3AA, Suva, Fiji	82,500
JA	JA1YAA, Japan	50,110
NL	NLWV, South Korea	80,110
KG6	KG6JDX, Guam	80,110
KH8	KH8EG, Hawaii	50,104
ZL1	ZL1WVF, Auckland	145,100
ZL2	ZL2WVF, Upper Mutt	28,170
ZL2VVF	Palmerston North	82,500
ZL2WVF	Wellington	145,200
ZL2VVF	Palmerston North	145,250
ZL2VVF	Palmerston North	431,650
ZL3	ZL3WVF, Christchurch	145,500
ZL4	ZL4WVF, Dunedin	145,400

All these plus numerous TV stations located to the north as per the listing last month. Keep a copy by your receiver

## SIX METRES

Although 6 metres has been relatively quiet from an Es point of view, quite a bit has been happening via TEP and other modes with stations to the north and north-east. Much of this was observed by Steve VK3OT who was going to write to me with specific details of the various openings, but at time of writing such information has not arrived so it will have to come as best I can. I have placed together the following information gleaned from contacts on the air.

On 9/4/77 ten metres was open most of the day, and tests were run between VK3OT and KG6APP in Guam and KH8IAA, the latter having access to the KH8EGJ beacon on 50.170. The 6 metre band opened 0748 to 0802Z, with KG6APP being worked on 50.170, receiving a SMRKR number 1725. KH8IAA heard 0746-7052Z. An AM station was noted on 52.050 peaking NNE: 0753-0758 opened to JA with JA1 to 4-5 x 9. Prior to 1/2 this the KH8EGJ beacon had been copied from time to time between 0512 and 0748. There has been more information which I have not got! On 10/4 S-wave noted strong telemetry signals on 52.080 peaking NNE. He

mentioned also there appeared to be little relationship on this occasion between the availability of signals on 28 MHz and those on 50 and 52 MHz.

Signals from Japan on 6 metres were available here in VK5 on 9/4 for several hours. I arrived home from a special Saturday job to find the band almost closed but did manage to work JA27TO, and was called by four others all on the same frequency but did not see the CW, the CW, after which the band closed. I had noted earlier that, before going to work about 1000 local, 28 MHz was fairly lively to Japan, so I was not surprised to hear the band had been open to there.

On 11/4 six metres opened to VK4 from here for about an hour with some very good signals, and I worked VK4ALM, VK4DO, VK4VW, and VK4ZHW in 20 minutes, as well as Robby VK5JJA on back scatter. Ross VK4RO mentioned JA's had been around since 20/3/73, and were 5 x 8 on 9/4, but mainly working the northern VK4 area, to VK4ZAZ, VK4FU Lindsay VK4ALM and Frank VK4FU in Rockhampton had also been hearing the Brisbane beacon for 2 metres which was a distance of 300 m or so and a bit rare for them.

It would appear from all this that the various continual promptings I give through these columns to keep an eye on six metres all times other than high Es periods, is paying off. In addition on the equinoxes there is always the chance of mid-winter XE through June and July. And despite the fact, Steve said about the lack of contact on between 28 and 52 MHz on the occasions he mentions, I am still of the opinion that for many occasions 28 MHz does serve as a good pointer and I am currently looking around for a reasonably good receiver which will give me complete coverage between 30 and 50 MHz so that any rise in MUF may be noted.

Still on the six metre scene, I have to hand a letter from Graham VK8CZJ who writes from Darwin to say the VK8VF beacon is definitely back on the air on 52.200 MHz, with Trevor VK8ZTW and Brian VK8VW getting it going again. It provides about 10 watts to a ground plane antenna 40 feet high, and located at East Point as before with panoramic sea views from south-west to north-east.

He further reports six metres has been interesting but not outstanding, with a total of six openings to JA to mid-April, two in the afternoon about 1600 local, and four in the evenings about 2100 local.

A local commercial beacon LSBA operated throughout March on 48.450 MHz. The beacon is involved with TEP investigations and runs about a watt. It is used by the air at sea, and has been around for many years so we expect it back on in the future some time.

Locally we watch for a signal on 49.750 which is the Russian/Chinese channel R1 video frequency. This is a good indicator here of evening band conditions. Signals are also heard on 49.305 (wideband) and on 50.170 (narrowband) among other things. 51.750 (Malaysian TV) and 51.750 (Malaysian TV) and so on. As well as a signal have been heard this year at 52 MHz, as well as signals to over 60 MHz.

You are probably aware of the activity of K1THAM on Shemya island and in the Aleutian Islands. He is a keen six metre man and is looking for JA contacts on the low end of the band. It is possible he will be in Australia, as such a signal was heard in 1970 up to this way.

The opening on 10/4 was very widespread with VK1, VK4 and KG6 in on the act on. At least three KG6 stations were on the low end of the band with massive JA pile-ups. No signals were heard here. As usual DU area has about eight 6 metre operators but I am not sure if this is a regular thing. A lot of information for 6 metre activity with almost continual chatter about 6 metres taking place. Of interest was a relay of VK6RO by a JA8 from 6 metres to 10 metres for the information of VK3AMK on 10/4. This gave us warning of an impending opening to VK8.

On 12/4 the TV on 49.750 burst up to fantastic strength. Brian was the first to 50.2 MHz and strengths well over S9 effectively blocking the low end of 6 metres. Absolutely no amateur signals were heard and we suppose that it was probably Hanking or China that we heard, being an evening QSO.

Signals in Darwin remains as before, VK8VV, VK8CZJ and myself, VK8CZJ on 6 metres, VK8VV and myself have odd chats on two and activity is

# ANNOUNCING NEW 2 METRE FM TRANSCEIVER FROM KENWOOD



TR7600A ☆ FULL 4 MHz COVERAGE ☆ 25 WATTS OUTPUT HIGH, 5 to 15 WATTS LOW OFFSET FOR REPEATER ±600 kHz  
FULLY SYNTHESISED ☆ 5 DIGITAL READOUTS ☆ LIMITED NUMBER EX STOCK \$385.

## KENWOOD TS820 HF TRANSCEIVER

The pacesetter, provides superior performance, versatility and features found in no other Transceiver \$980

## KENWOOD TS520 HF TRANSCEIVER

Offers top performance, dependability and versatility at a realistic price of \$650.

KENWOOD MATCHING ACCESSORIES

ICOM MODELS IC202, IC245, IC211, IC225

We can also supply from the YAESU MUSEN range, the FT301D, FT301S, FT221R, FRG7 communication receiver

FOR AMATEUR EQUIPMENT BASED ON COMPETITIVE PRICES, PHONE OR WRITE.

## AMATEUR ELECTRONIC IMPORTS

APPOINTED KENWOOD DEALER

## KENWOOD TS700A VHF TRANSCEIVER

2 metre SSB/FM/AM/CW, offset for repeater operation. Tuneable VFO. All solid state. Full 4 MHz coverage, AC/DC, 10 Watts Ideal for local — DX — or Oscar \$650

## KENWOOD TS600 VHF TRANSCEIVER

Matching in size and performance to the TS700A, coverage 50 to 54 MHz SSB/FM/AM/CW \$650.

P.O. BOX 160, KOGARAH, N.S.W. 2217

TELEPHONE (02) 547 1467

## ARLEC plug-pack

PS337

## PLUG IN POWER SUPPLY

THIS COMPACT UNIT  
PLUGS DIRECTLY INTO  
240 VOLT MAINS SUPPLY  
POWER SOCKETS AND  
PROVIDES 12 VOLT 1 AMP  
SMOOTHED D.C. FOR  
POWERING LOW VOLTAGE  
AND BATTERY OPERATED  
EQUIPMENT

TRANSCEIVERS  
CASSETTE RECORDERS  
CARTRIDGE PLAYERS  
BURGLAR ALARMS  
ELECTRIC MODELS & TOYS  
CAR RADIOS ETC

12 VOLT 1 AMP  
S.E.C. APPROVED  
DOUBLE INSULATED  
OVERLOAD PROTECTED



## BE A PERSONALITY

Radio is a personal hobby Your

## Q.S.L. CARD

should reflect your own personality

HAMS, NOVICES, SWL's AND

CB'ers

Send your own design or card to



27 NATHAN ROAD,

13 F 'F' KOGALOO, HONG KONG

HAM SUPPLIES — ANTENNAS —

ROTATORS — ACCESSORIES —

INEXPENSIVE FAST SERVICE

## QSP

### SHARING

Amateur radio by definition means communication an involvement with other people and ideas. Remember the next time you flip on that switch you're sharing part of yourself with someone else and getting part of someone else in return. Amateur radio is people. CQ March 77

A+R SOANAR ELECTRONICS GROUP

30 Lawton Road, Box 188, VIC. 3128, Australia.

Telex: 52385



SALES OFFICES PHONED  
VICTORIA: 03 8641  
N.S.W.: 76 2881  
S. AUSTR.: 31 8881  
QUEENSLAND: 53 5481  
WEST. AUSTR.: 43 6408  
SOANAR (JAPAN) LTD TOKYO

# MAKE IT ON 70 cm FROM YOUR MOBILE OR HOME STATION, 2m RIG

## NEW RELEASE — TRANSVERTER MODEL MMT432/144

UTILIZING an IF of 144 MHz ★ 10 WATTS DRIVE OR ½ WATT ★ VOX OPERATED

This 432 solid state linear transverter is intended for use with a 144 MHz transceiver to produce a high reliability transceive capability. A 10 watt load and RF sensing network eliminates the need for any ancillary circuitry. A single coaxial connection is all that is required between the transverter and the associated 144 MHz transceiver.

A wide range of applications is offered by this MMT432/144 transverter, which by virtue of its linear mode of operation will enable 144 MHz SSB, FM, AM or CW equipment to be used at 432 MHz.

Simply connect direct to your 2 metre rig, 12 volt supply, fit 70 cm antenna for instant SSB, FM, AM, CW operation.

**FEATURES:** High quality double-sided glass fibre printed board ★ Highly stable zener controlled oscillator stages ★ PIN diode serial changeover relay with less than 0.2 dB through loss ★ Extremely low noise receive converter, typ. Cat 3 dB ★ Separate receive converter output gives independent receiver facility ★ Built in Automatic RF VOX with overdrive facility ★ Built in 10 watt 144 MHz termination selectable attenuator for ½ watt ★ Use of the latest state of the art Power Amplifier transistors provides reliable 10 watts continuous output. Limited supply only available ex stock, further units currently on order for expected early delivery.

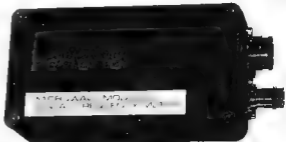
Model MMT432/144 — Price \$260

## TRANSVERTER MODEL MMT432/28

FEATURING COMBINATION OF A LOW-NOISE RECEIVE CONVERTER AND A LOW DISTORTION TRANSMIT CONVERTER PRODUCING A SPURIOUS-FREE LINEAR SSB SIGNAL PARTICULARLY WHERE HIGH STABILITY AND SENSITIVITY ARE OF IMPORTANCE.

Power Output 10 watts minimum ★ 28 MHz IF ★ Drive 1 mW to 500 mW ★ Aerial Changeover by PIN diode switch ★ Modern Microstrip Techniques ★ Power requirements 12 volt nominal at 150 mA 2.5 amp. peak ★ Case size 187 x 120 x 53 cm ★ Spare 432 input socket

Model MMT432 — Price \$215



## New Release — 500 MHz COUNTER

This counter has two ranges which are selected by supplying +12 volts to one of two pins on the DIN socket. Internal diode switching brings the input in the 0.45–50 MHz range to a wide-band amplifier which drives a high speed TTL divider in the main counter logic. On the 50–500 MHz range the diodes switch in a high speed ECL prescaler and the decade point is changed accordingly.

A low angle AT cut quartz crystal is used giving a typical temperature stability of 0.5 ppm per degree C. Provision is made for setting the crystal frequency, and the accuracy of reading is normally better than 200 Hz at 50 MHz or 2 kHz at 500 MHz.

The counter has reverse polarity protection and operates satisfactorily from a nominal 12V DC supply. A suitable 5 pin DIN plug is supplied.

### SPECIFICATION

Digit Height 10 mm  
Display Width 45 mm  
Case size 111 x 60 x 27 mm  
Frequency Ranges 0.45–50 MHz, 50–500 MHz  
Sensitivity Better than 50 mV RMS over 0.45–50 MHz Better than 200 mV RMS over 50–500 MHz  
Input Connector 50 ohm BNC  
Input Impedance 500 ohm approx. max.  
Power Connector 5 pin 27 pin locking DIN socket (supplied with plug)  
Power Requirements 11–15 volts DC at 300 mA approx. max.

Model MMD500P — 500 MHz Prescaler, \$55.  
Model MMD500 — 500 MHz Counter, \$175.

Model MMD050 — 50 MHz Counter, \$130

## MMT432 TRANSVERTER

## TRANSVERTER MODEL 144/28

This 144 MHz Solid State Linear Transverter is intended for use with 28 MHz transceiver to produce a highly reliable transceive capability for satellite or terrestrial communication. Power output 10W min. ★ 28 MHz drive ★ IF at 500 mW or 5 mW ★ Receiver gain and noise typical 30 dB and 2.5 dB ★ Internal Antenna changeover ★ Case size 187 x 120 x 53 cm ★ Spare 144 MHz input socket.

Model MMT144/28 — Price \$185

All modules are enclosed in black cast-aluminum cases of 13 cm by 6 cm by 3 cm and are fitted with BNC connectors input and output impedance is 50 ohms. Completely professional technology, manufacture, and alignment. Extremely suitable for operation via OSCAR 7 or for normal VHF/UHF communications.

**ONWARDS forwarding** It is recommended that items forwarded by Mail are registered. Post Office charge is \$2 this also includes insurance. If required goods will be forwarded by Ansett air freight or road transport collect.

Australian Distributors for Microwave Modules Limited:

# AMATEUR ELECTRONIC IMPORTS

P.O. BOX 160, KOGARAH 2217, N.S.W.

PHONE: (02) 547 1467

quite low. Reports of the VK6VF beacon are solicited and QSL's will be provided for reports received. Thanks, again, for the news, all this helps us in the south to keep abreast of the northern activity and tends to keep us listening just that little more often!

A further letter from the Darwin area, this time from Sam, VK6SU advises that the Darwin Amateur Radio Club is aware of it. Now, the VHF calling frequency in the Darwin area is Channel 50 FM. It is believed some visitors to the area have not been aware of this. Thanks, Sue

Tony VK6BV in Kaaporlie writes as follows. Just a quick note to say I took your advice (AR April 1977) and turned the beam north and heard JA activity on 184.4 on 50.1 to 50.3. Called on 52.005 and heard a J2 come back. That was all I copied. Nothing for the next few days. On 18/4 again a JA signal on 50 MHz, called same frequency and worked three JA stations. Signals peaked to 5 x 7 for the 15 minute opening, with the JA's running about 20 watts, and I received 5 x 9 plus 10 for 120W PEP. Thanks, Tony, passed to know you are sharing in the across the equator openings during the equinoxes.

## TWO METRES

I cannot report on this band at the moment, although I know there have been some excellent openings across southern Australia. My operating hours for the past few weeks have been rather limited due to unfortunately having two very close friends in hospital diagnosed as having serious cancer infections, one being a terminal illness. Please accept my explanation as being the reason for not getting the news in the usual way, that is, off the air.

## RELEVANT NEWS

I am pleased to report what is probably a world record for an RTTY two-way contact on 432 MHz which occurred on 8/2/77, between Bob VK6SPB and Aub VK6XY, with signals to 599 and 10 watts each way. Bob used a 16 element KLM at 92 feet and Aub a 15 element yagi at 27 feet. This information did get to me on a prior date closer to the happening, but don't know where the note got to, but even if mentioned rather late, congratulations are all in order for you two gents, and we hope the claim for the record does come a fact.

Incidentally, I did have a State visit from Aub VK6XY recently while he was returning from his extended holiday tour from the eastern States. It was pleasing to meet Aub again after a long period, and to learn a bit more about the happenings in Albany.

How many of you are aware of the ARRL list of do's and don'ts for those who use repeaters. I am sure if they were followed out by all the repeaters could become a source of pleasure all over the country!

DO keep all transmissions short. Emergencies don't wait for monologues to finish. If you talk to hear your own voice, what you need is a tape recorder and an FM rig.

DO think before you transmit it. If you can't think of anything worth saying, don't say anything.

DO pause a couple of seconds between exchanges. Someone with a high priority need for the repeater may want to break in.

DO identify properly.

DO be courteous. A repeater is like a telephone party line, and its use requires the same kind of co-operation.

DO use simplex wherever possible. Leave the repeaters for those who need them.

DO use the minimum power necessary to maintain communication.

DO support your local repeater club, even if it does not require all users to be members. Maintaining a good machine is expensive.

DON'T break into a contact unless you have something to add. Interrupting is no more polite on the air than it is in person.

DON'T forget that amateur radio is allocated frequencies because it is a service, not just a hobby. Don't neglect the public service aspects of VHF/FM communication, such as accident reporting, emergency preparedness.

DON'T try to prove what a great operator you are on the air by criticizing the techniques of others. Instead set an example which others will be proud to follow.

DON'T monopolize a repeater. The best repeater users are the ones who do a lot of listening and little transmitting.

DON'T forget that what you say over a repeater can be heard over many square miles by people with an inexpensive public service band monitor. These people are potential amateurs, if they like what they hear they may join us. Don't leave them with a bad impression of our hobby by making thoughtless or off-colour remarks.

There's food for thought in the above rules.

Have you given any thought to the suggestion of an HF net for the exchange of information about VHF and UHF activities which was mentioned recently through these columns? You must be all still thinking about it because I have not had a single letter from anyone yet for or against. And VK6XY while here spoke of the suggestion favourably, so that's one on the list. How about the rest of you saying something?

From the columns of the Gold Coast Radio Club News: a note from Frank VK4VN warning about TVI. Frank has been hit with this problem for some time and attributes a lot of his problems to the use of transistor distribution amplifiers, a common type which has a gain of 40 dB. This particular type is fitted with two pots for individual gain adjustment on HI and LO bands.

The major source of trouble appears to stem from the detection of strong signals on a faulty (high resistance) antenna (TV). A high pass filter is the input to the amplifier circuit this one every time. Frank says the constant K type of filter as sold by an American chain of Radio Shacks is useless for this purpose, and advises anyone with the problem to construct the filter described in the ARRL handbook. Alternatively, you may contact Frank direct for some good first hand information.

## MINIMUMIMUM NETWORK

From The Propagator comes news of the scheduled tests by VK2AMW on 26/3/77 which

yielded the following results. OZCQR—called but nothing heard, and the same results with F2TU. The echoes from VK2AMW at that stage were peaking 7 dB over noise. G3LTF contact made with M signal reports both ways. A contact was also made with F8T who called near the end of the contact with G3LTF. Visitors to the shack during the above tests were Peter Vander and two friends, VK2ALU and VK2ZEN operated.

Lyle advises the following. Should anyone wish to come on a Dag to see what goes on during moonbounce tests, then if they will give a phone number, on which they may be contacted a day or two prior to the test weekend, to either VK2ALU or VK2ZEN then one of us will phone to advise of the test period.

Monthly tests are scheduled for most stations. Increased in 432 MHz EME contacts by Car Mass VTB883 who passes on the test schedules via the 432 EME News which is sent each month to all concerned by Allen Katz K2UYH. I don't usually get the 432 EME News until a few days prior to the test weekend.

VK2AMW is scheduled on over the period shortly after moonrise at our local on stations in North America and shortly before moonset for stations in Europe, as it is on y during these periods that both stations concerned can each see the moon simultaneously. We would be happy to have visitors at any test.

I can recommend a visit to the VK2AMW shack during an EME test if you wish to observe the amount of work involved, and having been a visitor myself last year I came away with a much better appreciation of the obvious dedication to Lyle and Charlie devote to this project, and they are to be congratulated.

That's about it for now, so will close with the thought for the month, "How often we fail to realise our good fortune in living in a country where happiness is more than lack of tragedy."

75. The Voice in the Hills.

## TRY THIS

With the Technical Editors

## HOW TO RAISE THAT MAST

T. Laidler VK6TL.

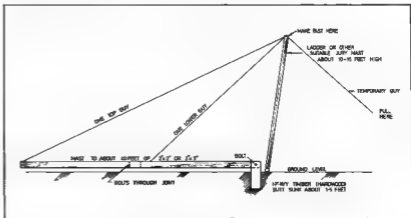
Here is a sure method of raising and lowering a mast without incurring any damage.

The scheme is shown in the sketch. A couple of extra hands holding other guys to stop the assembly swinging on its way up or down are also desirable. Don't let anyone tell you he can hold it without the jury mast. He will be proved wrong and

the mast might break in the attempt. Be warned.

If the "butt" in the ground is a short section of something like an old railway sleeper it will easily take a "U" section cut so that the bottom of the mast can swing in it easily.

An application of chloroform to the nut helps to discourage termites if there are any in the area. I have also used creosote for the same reason but I think chloroform is better.



# AMATEUR EXAM

— FEB. 1977

## POSTAL AND TELECOMMUNICATIONS DEPARTMENT AMATEUR OPERATORS' CERTIFICATE OF PROFICIENCY

February, 1977.

### SECTION M (Theory)

(Time allowed — 2½ hours.)

NOTE: SEVEN questions only to be attempted. Credit will not be given for more than SEVEN answers. All questions carry equal marks.

- (a) Draw a circuit diagram of a Plate-modulated radio-frequency amplifier and modulator stages of a 150 watts DC input amateur band transmitter.
- (b) Describe fully how 100 per cent modulation is obtained.
- (a) Describe the manner by which High-frequency radio waves may be propagated over long distances. Explain why communications between countries such as America and Australia is restricted to certain times in the HF bands.
- (b) Explain why communications over long distances as described in (a) is not possible using the VHF and UHF amateur bands.
- With the aid of circuit diagrams describe the operation and meaning attributed to the following filter types:
  - High-Pass.
  - Low-Pass.
  - Band-Pass.
- (a) With the aid of a sketch describe the construction and theory of operation of a crystal microphone.
- (b) Listing component values, show by means of circuit diagrams how this type of microphone is connected to an amplifier.
- (a) A double-conversion type super-heterodyne receiver is tuned to a signal on 14.1 MHz which is amplitude modulated by a 1000 Hz tone. Draw a block diagram of such a receiver and show typical frequencies present at the input and output of each stage.
- (b) Discuss the theory of operation of this type of receiver and list any advantages and disadvantages it may have in comparison with the single-conversion type.
- (a) Draw a block diagram of an SSB transceiver and indicate on your diagram the common stages for both transmit and receive channels.
- (b) Explain the operation of the transceiver.
- Assisted by a circuit diagram describe the operation of a Mains operated power supply which uses Silicon di-

odes. The power supply is required to provide a regulated output of 6 volts to supply a crystal oscillator and an unregulated output of 9 volts for a buffer stage of a transistor type transmitter.

- (a) Show a circuit diagram of the final RF stage of a transmitter using a triode valve, and state step by step how you would neutralize it.
- (b) What effects would result from operating such an amplifier which was not neutralized? Explain your answer.
- Three resistors R1, R2 and R3 of 1000, 200 and 300 ohms respectively are connected in series across a 15 volts DC supply of negligible impedance. Calculate:
  - the potential differences across each resistor,
  - the power dissipated by R2, i.e., 200 ohms,
  - the voltage reading will be obtained if a voltmeter, having an internal resistance of 1000 ohms, is connected across R1, i.e., 1000 ohms.

The February AOCF examination continues the trend to keep the examination in line with current techniques. This has been evident in recent examinations in the insertion of questions on FM and the emphasis given to questions relating to spurious emissions and interference.

In the February examination the topic of filters was brought in after several years and a new question relating to current equipment was introduced.

Filters are an essential part of interference prevention and most equipment is now of the transceiver type making the new question most topical.

Similarly the topic of FM which has been in recent examinations is part of the current scene. The newcomer may well start off with FM equipment and the use of FM has become very widespread.

Maybe the next topics to be introduced may be FM repeaters and then simple Phase Lock Loops and Digital Counting.

For those intending candidates the study of previous examination question topics is still a very reliable means of covering the required theoretical knowledge. Questions on many basic topics must continue to cover the same ground as the basic theory is fairly constant over many years.

A survey of AOCF question topics shows the following for the period from February 1974 to February 1977:—

Transmitters, 9 questions; Microphones and Audio, 7 questions; Calculations, 5 questions; SSB, 5 questions; Propagation, 5 questions; Interference, 4½ questions; Receivers, 4 questions; PSUs, 4 questions; Antennae, 3½ questions; Test Equipment, 3 questions; FM, 3 questions.

During this period there were 5 exams with a total of 9 questions on each. ■

## 10.7 MHz CRYSTAL FILTERS FOR FM SYNONYMOUS FOR QUALITY AND ADVANCED TECHNOLOGY



KVG

### MATCHING CRYSTAL DISCRIMINATORS

NBFM XD107-01  
WBFM XD107-02  
(1-9) \$25.50 each

EXPORT ENQUIRIES WELCOME



SPECTRUM  
INTERNATIONAL  
BOX 1084A CONCORD  
MASSACHUSETTS 01742  
U.S.A.

Filter Type	XF107 A	XF107 B	XF107 C	XF107 D	XF107 E	XF107 S04	XF107
Application	NBFM	NBFM	SSB	WBFM	NBFM	NBFM	NBFM
Number of Filter Crystals	8	8	8	6	8	4	2
Bandwidth	12.0 kHz	15.0 kHz	30.0 kHz	36.0 kHz	40.0 kHz	14.0 kHz	14.0 kHz
Pass Band Ripple	< 2 dB				< 1 dB		
Insertion Loss	< 3.5 dB	< 3.5 dB	< 4.5 dB	< 4.5 dB	< 4.5 dB	< 3 dB	< 1.5 dB
Input Output	620 Ω	910 Ω	620 Ω	2700 Ω	2700 Ω	910 Ω	7500 Ω
Termination	25 pF	25 pF	25 pF	25 pF	25 pF	25 pF	25 pF
Shape Factor	(70 dB) 2.4 (100 dB) 2.8	(70 dB) 2.3 (100 dB) 2.9	(70 dB) 2.2 (100 dB) 2.7	(70 dB) 1.9 (100 dB) 2.5	(70 dB) 2.0 (100 dB) 2.5	(40 dB) 3.0 (100 dB) 5.7	(70 dB) 3.6 (100 dB) 5.7
Ultimate Attenuation	> 90 dB				> 50 dB		
Size	1 7/16" x 1 3/16" x 3/4" High				MC 6/8" x MC 18/18"		
	Mounting Hardware Included				CAN		
Price (1-9)	\$42.85				\$19.90		

Registration Fee: \$2.00; Air Mail: 31c per ½ oz.  
Shipping weights: Filters 2 oz. ea., Crystals ½ oz. ea.  
All Prices in U.S. Dollars.

# FERGUSON

## DEVELOPMENTS

Once Ferguson made a transformer like this —



It was the Ferguson PF2155 and was an extremely useful and popular transformer

### IN THE INTERESTS OF SAFETY

The Ferguson Engineering Staff considered improvements to the terminations were necessary. It was decided to make a transformer which was designed to comply with Australian Standard C126. The result looks like this —



#### Advantages:

- 8 Secondary Terminals
- Quick-connect pinlok type connections
- 6 x 30 cm leads supplied with shrouded receptacles
- Low-profile configuration with mounting holes as well as slots

The range of output voltages is: 1.5V, 3V, 4.5V, 6V, 7.5V, 9V, 10.5V, 12V, 13.5V, 15V and 18V

Additionally centre tapped configurations also available, e.g. 9V-0-9V, 7.5V-0-7.5V, 6V-0-6V, 4.5V-0-4.5V, 3V-0-3V and 1.5V-0-1.5V

Two types are available: PL 1.5-18/20VA at 1.1 AMP and PL 1.5-18/40VA at 2.2 AMPS

Available from your  
**ELECTRICAL  
WHOLESALE**

Manufactured by:  
**FERGUSON TRANSFORMERS**

P/L

Head Office: 331 High Street,  
Chatswood, NSW 2067.

Phone (02) 487-8261 — Telex: AA25728.

# WANT TO SAVE MONEY?



Right now, you have the chance to save nearly \$50 on a package deal containing the value-packed Multi-7 2 metre rig

That's right, almost \$50 — if you act NOW. We don't have to tell you about the Multi-7 except to say it is one of the hottest 2 metre transceivers on the market. It is ideal for base of mobile operation.

With the Multi-7, we'll throw in a dual 6 & 2 metre mobile whip (15/8 on 6, 1/4 on 2) plus a magnetic base and lead assembly to suit this whip.

And possibly the best part: we'll GIVE you a free (yes FREE!) copy of the 1977 Dick Smith Catalog. Isn't that fantastic?



Multi-7 2 metre FM transceiver 23 channel capacity from 145 — 148MHz, 1W or 10W output. Supplied with m.c. accessories & list

Let's do some simple arithmetic:

Cart D-3007 Multi-7 Transceiver \$189.00

Cart D-4620 6 & 2 metre whip \$22.50

Cart D-4622 Mag. base & lead ass. \$25.00

Total price: \$236.50

Plus Dicks 1977 Catalog (Priceless)

YOU PAY: \$189.00

Now if that doesn't add up to value, then you are a lousy mathematician.

**\$236.50**  
COMPLETE  
OUTFIT: **\$189**

Strictly while stocks last!

## DICK SMITH ELECTRONICS

VISIT YOUR NEAREST STORE:

SYDNEY — 125 York St, Ph. 28 1126

BANKSTOWN — 381 Hume Hwy, Ph. 789 6606

GORE HILL — 162 Pacific Hwy, Ph. 426 5311

MELBOURNE — 656 Bridge Rd, Richmond, Ph. 42 1614

BRISBANE — 166 Logan Rd, Bayside, Ph. 381 6233

MAIL ORDERS: P.O. Box 747, Crows Nest, N.S.W. 2065.

bankcard

welcome here

We have dealers across Australia. Phone us for the one nearest you!

# R.H. Cunningham

Pty Ltd

## This lead acid battery can be fitted in any position . . .



- Unspillable
- Completely Sealed
- Rechargeable
- Fumeless

Sonnenschein batteries are of the lead-acid type, ideal for all kinds of portable electronic equipment requiring 2, 6 or 12 volts at 9 to 7 amp hours capacity. Send for free comprehensive Technical Manual



## Sonnenschein

Sonnenschein  
dryfit PC  
BATTERIES

For the man who has  
a battery problem.

Available from Wholesalers  
or the Australian Agents

# R.H. Cunningham

Pty Ltd

VIC. 453-499 Victoria St West  
Melbourne 3003 Ph. 329 9633  
N.S.W. 4-8 Waters Rd Neutral  
Bay 2089 Ph. 909 2388  
W.A. 256 Stirling St Perth  
6000 Ph. 28 3655  
QLD. L. E. BOUGHEN & CO  
30 Grimes St Auchincloss  
4086 Ph. 370 8087  
S.A. Werner Electronic  
Industries Pty Ltd Lnd 25,  
6-8 Gray St Kilburny 5009  
Ph. 268 2801

Telex Melbourne 31447  
Sydney 21707 Brisbane  
41500 Perth 93244

## CONTESTS

Kevin Phillips, VK3AUQ  
Box 67, East Melbourne, 3002

### ROSS HULL VHF/UHF MEMORIAL CONTEST 1976-77 RESULTS

Trophy winner VK4DO, H. L. Hobler.  
48 hour certificate VK8ZGJ, G. G. Baker.

Detailed scores—1st Column 7 day, 2nd column 48 hours.

#### Section (a) Transmitting Open:

VK7MC	2644	1248
3KK	1406	570
3AUQ	1146	
3VF	1138	584

#### Section (b) Transmitting Phone:

VK4DO	8053	2158
7ZAH	5820	1742
2ZFB	5392	1718
8ZCJ	5243	2064
1ZAR	4983	1538
3ASQ	4818	1412
4ZRF	4702	1382
4ZRO	4321	1312
1RK	4299	1700
5LP	3808	1882
2YDY	3132	1070
82BW	2994	1486
2ZCT	2790	1202
4ZSH	2706	890
2BMX	2047	902
8ZKO	1933	1082
3AVJ	1920	890
P29GA	1902	1270
VK2HZ	1506	482
4ZJP	1475	1298
3AUI	1424	836
6ZMM	1141	450
7AK	895	

#### Section (c) Transmitting CW:

VK4XA	2048	800
-------	------	-----

#### Section (d) Receiving:

No logs received.

#### CONTEST CALENDAR

June	11/12	RSGB National Field Day
	11/12	VK2 VHF Mid-Winter Field Day
	18/19	A1 Asian Phone Contest
	28/28	ARRL Field Day
July	2/3	DL Activity GRP Contest
	2/3	YV Phone
	8/10	IARU Red spot Championship
	8/10	RAS SEANET WW DX-CW Contest
	16/17	15-10 Net QSO Party
August	13/14	*REMEMBRANCE DAY CONTEST
	13/14	European CW Contest
	20/21	RAS SEANET WW DX Phone Contest
	20/21	SARTG RTTY Contest
	27/28	A1 Asian CW Contest
September	10/11	European Phone Contest
	17/18	Scandinavian CW Contest
	24/25	Scandinavian Phone

#### IARU RADIOSPORT CHAMPIONSHIP

July 5-10 UTC. Single and multi-operator, but no multi-transmit. A1 bands 160 to 2 metres, and Oscar satellite may be used, but no crossband. Oscar counts as a separate band. Contacts within one's own DXCC country count 1 point, same continent 2 points, outside one's own continent 3 points. Multiplier is the sum of the number of different ITU zones worked on each band. Exchange signal report and ITU zone. Final score is QSO points times zone multiplier.

## OLD TIMER WINS ROSS HULL

VK4DO of Rockhampton, Queensland, was born in that city in 1906, and during a long spell in hospital from a knee injury when he was 14 years old, decided to do something about learning "wireless". Self taught from what he could read, in 1923 he acquired his first licence, A4DO, for 10 watts on 240 metres, and there being only two broadcast stations in Queensland at that time (in Brisbane), he entertained the few local listeners with music and records every Sunday morning. There were no pick-ups in those times. Harold would wind up the old portable gramophone, put on a record and drop the carbon mike down into the sound box. Using absorption loop modulation and 140 volts HT on a 202 valve he was heard in New Zealand. The "B" batteries for the HT became expensive, so a rectifier was made from aluminium and lead in a borax solution, placed in large glass jars. To prevent the evaporation of the solution (and keep the moths out) a layer of kerosene was floated on top and every few days the moths were skimmed off.

To improve the RAC note, he next acquired a 500 volt DC generator and with the DC note on CW was the envy of many of the old timers. In those days you could pick a station by the tone of his signal. Always trying to improve his station, he acquired a 210 valve to increase the power to 50 watts input. This tube served for six years and did a mighty job. With 500 volts on the plate if you held the key down too long the plate would get a cherry red from the centre outwards. Before it gave up its life, you could see the grid through a crack burnt through the plate.

In the mid 1920's receiving conditions were good and many times station KGO in Oakland, California, was received direct on 312 metres on a one and two valve set. Acquiring the AOCIP in 1925, and being allowed to operate on the 80 metre band, the stage was set for better things. June 1926 saw the accomplishment of two-way QSO's with USA and Hawaii using very

low power, for which he was awarded Queensland winner of the "Miles Per Watt Competition". In the same year his station was awarded an "A" grade certificate in the 1926 Trans-Pacific Tests by the WIA and ARRL for the reception of a 500 word test message across the Pacific Ocean. His First Class ticket for a sea-going operator came in 1928, the days of spark transmitters and one valve P1 receivers, with a 10 in. spark coil for emergency transmitter.

Around this time "Low Loss" receivers were very popular, the coils being home wound of 8 and 10 gauge copper wire. Harold made a two valve receiver, with a 1/4 in plate glass panel, the holes being drilled with a hand drill and broken off three-cornered files—a very tedious job. It was in June of 1928 that Sir Charles Kingsford Smith's plane, the "Southern Cross", flew from California to Brisbane. Signals were copied from the plane and supplied to the Rockhampton newspapers, which featured them as news items.

The following years brought several awards, namely Worked All Continents in the year 1936 in 50 minutes, first prize by "Short Wave and Television" (USA) for Best Amateur Station, DXCC, Worked All States (USA) in one year, Honolulu Club Emergency Net, WAZ for CW in 1950; for phone in 1958 and for SSB in 1969, including many placings in ARRL; "CQ", RD, "VK-ZL Oceania" and Ross Hull Contests. Best performance was working all six continents in 1973 in 11 minutes on 14 MHz SSB without any prior schedules.

In 54 years, VK4DO has been operative except for the war years. Just about every part for amateur radio has been home made except for valves. Over 64,000 contacts have been made in over 300 countries. A member of WIA for over 40 years and recently retired after nine years as CQ Branch President, you will still find this "Old Timer" around the bands.

The 1976-77 Ross Hull Contest turned out to be Harold's year with 6053 points in the seven day section, and 2158 points in the 48 hour section. ■

Send logs to IARU Headquarters, Box AAA, Newing on, CT 06111, USA. Awards in the form of certificates will be awarded to the highest scoring CW, phone and mixed code entry from each ITU zone and DXCC country.

#### RAS SEANET WW DX CONTEST

CW July 8/10, Phone August 20/21. Single band-single operator, multi band-single operator and multi band multi operator sections. 160 to 10 metres may be used. Contest call is CQ SEA for CW and CQ SEATEST on Phone. Send RS/RST report and a serial number starting at 001 and increasing by 1 for each contact. Contacts between stations in own country will not be counted.

Scoring: SEANET area contestants to one's SEANET 160 metres 10 points, 80/40 metres 5 points, and 20/15/10 2 points. Contacts between SEANET stations count 160 metres 6 points, 80/40

metres 3 points, and 20/15/10 metres 1 point. Multipliers: For SEANET and outside SEANET areas, 3 points per country, and between SEANET stations, 2 points per country. Final score is the sum of QSO points times the sum of the multipliers.

Use a separate log for each band, and log all times in GMT. Send logs and a summary sheet to SEANET Contest Committee, c/o: Razak "Ethan" SMRKP, 281-C Jalan Pakekilling, Bukit Glugor, Penang, Malaysia. Logs must be received before October 31, 1977.

Restrictions: No crossmode crossband or mixed CW/Phone logs will be accepted. Only one transmission allowed at any time. Only one contact per band with the same station will count.

SEANET area prefixes: A1, A2, A3, A4, A5, A6, A7, A8, A9, A10, A11, A12, A13, A14, A15, A16, A17, A18, A19, A20, A21, A22, A23, A24, A25, A26, A27, A28, A29, A30, A31, A32, A33, A34, A35, A36, A37, A38, A39, A40, A41, A42, A43, A44, A45, A46, A47, A48, A49, A50, A51, A52, A53, A54, A55, A56, A57, A58, A59, A60, A61, A62, A63, A64, A65, A66, A67, A68, A69, A70, A71, A72, A73, A74, A75, A76, A77, A78, A79, A80, A81, A82, A83, A84, A85, A86, A87, A88, A89, A90, A91, A92, A93, A94, A95, A96, A97, A98, A99, A100, A101, A102, A103, A104, A105, A106, A107, A108, A109, A110, A111, A112, A113, A114, A115, A116, A117, A118, A119, A120, A121, A122, A123, A124, A125, A126, A127, A128, A129, A130, A131, A132, A133, A134, A135, A136, A137, A138, A139, A140, A141, A142, A143, A144, A145, A146, A147, A148, A149, A150, A151, A152, A153, A154, A155, A156, A157, A158, A159, A160, A161, A162, A163, A164, A165, A166, A167, A168, A169, A170, A171, A172, A173, A174, A175, A176, A177, A178, A179, A180, A181, A182, A183, A184, A185, A186, A187, A188, A189, A190, A191, A192, A193, A194, A195, A196, A197, A198, A199, A200, A201, A202, A203, A204, A205, A206, A207, A208, A209, A210, A211, A212, A213, A214, A215, A216, A217, A218, A219, A220, A221, A222, A223, A224, A225, A226, A227, A228, A229, A230, A231, A232, A233, A234, A235, A236, A237, A238, A239, A240, A241, A242, A243, A244, A245, A246, A247, A248, A249, A250, A251, A252, A253, A254, A255, A256, A257, A258, A259, A260, A261, A262, A263, A264, A265, A266, A267, A268, A269, A270, A271, A272, A273, A274, A275, A276, A277, A278, A279, A280, A281, A282, A283, A284, A285, A286, A287, A288, A289, A290, A291, A292, A293, A294, A295, A296, A297, A298, A299, A300, A301, A302, A303, A304, A305, A306, A307, A308, A309, A310, A311, A312, A313, A314, A315, A316, A317, A318, A319, A320, A321, A322, A323, A324, A325, A326, A327, A328, A329, A330, A331, A332, A333, A334, A335, A336, A337, A338, A339, A340, A341, A342, A343, A344, A345, A346, A347, A348, A349, A350, A351, A352, A353, A354, A355, A356, A357, A358, A359, A360, A361, A362, A363, A364, A365, A366, A367, A368, A369, A370, A371, A372, A373, A374, A375, A376, A377, A378, A379, A380, A381, A382, A383, A384, A385, A386, A387, A388, A389, A390, A391, A392, A393, A394, A395, A396, A397, A398, A399, A400, A401, A402, A403, A404, A405, A406, A407, A408, A409, A410, A411, A412, A413, A414, A415, A416, A417, A418, A419, A420, A421, A422, A423, A424, A425, A426, A427, A428, A429, A430, A431, A432, A433, A434, A435, A436, A437, A438, A439, A440, A441, A442, A443, A444, A445, A446, A447, A448, A449, A450, A451, A452, A453, A454, A455, A456, A457, A458, A459, A460, A461, A462, A463, A464, A465, A466, A467, A468, A469, A470, A471, A472, A473, A474, A475, A476, A477, A478, A479, A480, A481, A482, A483, A484, A485, A486, A487, A488, A489, A490, A491, A492, A493, A494, A495, A496, A497, A498, A499, A500, A501, A502, A503, A504, A505, A506, A507, A508, A509, A510, A511, A512, A513, A514, A515, A516, A517, A518, A519, A520, A521, A522, A523, A524, A525, A526, A527, A528, A529, A530, A531, A532, A533, A534, A535, A536, A537, A538, A539, A540, A541, A542, A543, A544, A545, A546, A547, A548, A549, A550, A551, A552, A553, A554, A555, A556, A557, A558, A559, A560, A561, A562, A563, A564, A565, A566, A567, A568, A569, A570, A571, A572, A573, A574, A575, A576, A577, A578, A579, A580, A581, A582, A583, A584, A585, A586, A587, A588, A589, A590, A591, A592, A593, A594, A595, A596, A597, A598, A599, A600, A601, A602, A603, A604, A605, A606, A607, A608, A609, A610, A611, A612, A613, A614, A615, A616, A617, A618, A619, A620, A621, A622, A623, A624, A625, A626, A627, A628, A629, A630, A631, A632, A633, A634, A635, A636, A637, A638, A639, A640, A641, A642, A643, A644, A645, A646, A647, A648, A649, A650, A651, A652, A653, A654, A655, A656, A657, A658, A659, A660, A661, A662, A663, A664, A665, A666, A667, A668, A669, A670, A671, A672, A673, A674, A675, A676, A677, A678, A679, A680, A681, A682, A683, A684, A685, A686, A687, A688, A689, A690, A691, A692, A693, A694, A695, A696, A697, A698, A699, A700, A701, A702, A703, A704, A705, A706, A707, A708, A709, A710, A711, A712, A713, A714, A715, A716, A717, A718, A719, A720, A721, A722, A723, A724, A725, A726, A727, A728, A729, A730, A731, A732, A733, A734, A735, A736, A737, A738, A739, A740, A741, A742, A743, A744, A745, A746, A747, A748, A749, A750, A751, A752, A753, A754, A755, A756, A757, A758, A759, A760, A761, A762, A763, A764, A765, A766, A767, A768, A769, A770, A771, A772, A773, A774, A775, A776, A777, A778, A779, A780, A781, A782, A783, A784, A785, A786, A787, A788, A789, A790, A791, A792, A793, A794, A795, A796, A797, A798, A799, A800, A801, A802, A803, A804, A805, A806, A807, A808, A809, A810, A811, A812, A813, A814, A815, A816, A817, A818, A819, A820, A821, A822, A823, A824, A825, A826, A827, A828, A829, A830, A831, A832, A833, A834, A835, A836, A837, A838, A839, A840, A841, A842, A843, A844, A845, A846, A847, A848, A849, A850, A851, A852, A853, A854, A855, A856, A857, A858, A859, A860, A861, A862, A863, A864, A865, A866, A867, A868, A869, A870, A871, A872, A873, A874, A875, A876, A877, A878, A879, A880, A881, A882, A883, A884, A885, A886, A887, A888, A889, A890, A891, A892, A893, A894, A895, A896, A897, A898, A899, A900, A901, A902, A903, A904, A905, A906, A907, A908, A909, A910, A911, A912, A913, A914, A915, A916, A917, A918, A919, A920, A921, A922, A923, A924, A925, A926, A927, A928, A929, A930, A931, A932, A933, A934, A935, A936, A937, A938, A939, A940, A941, A942, A943, A944, A945, A946, A947, A948, A949, A950, A951, A952, A953, A954, A955, A956, A957, A958, A959, A960, A961, A962, A963, A964, A965, A966, A967, A968, A969, A970, A971, A972, A973, A974, A975, A976, A977, A978, A979, A980, A981, A982, A983, A984, A985, A986, A987, A988, A989, A990, A991, A992, A993, A994, A995, A996, A997, A998, A999, A1000, A1001, A1002, A1003, A1004, A1005, A1006, A1007, A1008, A1009, A1010, A1011, A1012, A1013, A1014, A1015, A1016, A1017, A1018, A1019, A1020, A1021, A1022, A1023, A1024, A1025, A1026, A1027, A1028, A1029, A1030, A1031, A1032, A1033, A1034, A1035, A1036, A1037, A1038, A1039, A1040, A1041, A1042, A1043, A1044, A1045, A1046, A1047, A1048, A1049, A1050, A1051, A1052, A1053, A1054, A1055, A1056, A1057, A1058, A1059, A1060, A1061, A1062, A1063, A1064, A1065, A1066, A1067, A1068, A1069, A1070, A1071, A1072, A1073, A1074, A1075, A1076, A1077, A1078, A1079, A1080, A1081, A1082, A1083, A1084, A1085, A1086, A1087, A1088, A1089, A1090, A1091, A1092, A1093, A1094, A1095, A1096, A1097, A1098, A1099, A1100, A1101, A1102, A1103, A1104, A1105, A1106, A1107, A1108, A1109, A1110, A1111, A1112, A1113, A1114, A1115, A1116, A1117, A1118, A1119, A1120, A1121, A1122, A1123, A1124, A1125, A1126, A1127, A1128, A1129, A1130, A1131, A1132, A1133, A1134, A1135, A1136, A1137, A1138, A1139, A1140, A1141, A1142, A1143, A1144, A1145, A1146, A1147, A1148, A1149, A1150, A1151, A1152, A1153, A1154, A1155, A1156, A1157, A1158, A1159, A1160, A1161, A1162, A1163, A1164, A1165, A1166, A1167, A1168, A1169, A1170, A1171, A1172, A1173, A1174, A1175, A1176, A1177, A1178, A1179, A1180, A1181, A1182, A1183, A1184, A1185, A1186, A1187, A1188, A1189, A1190, A1191, A1192, A1193, A1194, A1195, A1196, A1197, A1198, A1199, A1200, A1201, A1202, A1203, A1204, A1205, A1206, A1207, A1208, A1209, A1210, A1211, A1212, A1213, A1214, A1215, A1216, A1217, A1218, A1219, A1220, A1221, A1222, A1223, A1224, A1225, A1226, A1227, A1228, A1229, A1230, A1231, A1232, A1233, A1234, A1235, A1236, A1237, A1238, A1239, A1240, A1241, A1242, A1243, A1244, A1245, A1246, A1247, A1248, A1249, A1250, A1251, A1252, A1253, A1254, A1255, A1256, A1257, A1258, A1259, A1260, A1261, A1262, A1263, A1264, A1265, A1266, A1267, A1268, A1269, A1270, A1271, A1272, A1273, A1274, A1275, A1276, A1277, A1278, A1279, A1280, A1281, A1282, A1283, A1284, A1285, A1286, A1287, A1288, A1289, A1290, A1291, A1292, A1293, A1294, A1295, A1296, A1297, A1298, A1299, A1300, A1301, A1302, A1303, A1304, A1305, A1306, A1307, A1308, A1309, A1310, A1311, A1312, A1313, A1314, A1315, A1316, A1317, A1318, A1319, A1320, A1321, A1322, A1323, A1324, A1325, A1326, A1327, A1328, A1329, A1330, A1331, A1332, A1333, A1334, A1335, A1336, A1337, A1338, A1339, A1340, A1341, A1342, A1343, A1344, A1345, A1346, A1347, A1348, A1349, A1350, A1351, A1352, A1353, A1354, A1355, A1356, A1357, A1358, A1359, A1360, A1361, A1362, A1363, A1364, A1365, A1366, A1367, A1368, A1369, A1370, A1371, A1372, A1373, A1374, A1375, A1376, A1377, A1378, A1379, A1380, A1381, A1382, A1383, A1384, A1385, A1386, A1387, A1388, A1389, A1390, A1391, A1392, A1393, A1394, A1395, A1396, A1397, A1398, A1399, A1400, A1401, A1402, A1403, A1404, A1405, A1406, A1407, A1408, A1409, A1410, A1411, A1412, A1413, A1414, A1415, A1416, A1417, A1418, A1419, A1420, A1421, A1422, A1423, A1424, A1425, A1426, A1427, A1428, A1429, A1430, A1431, A1432, A1433, A1434, A1435, A1436, A1437, A1438, A1439, A1440, A1441, A1442, A1443, A1444, A1445, A1446, A1447, A1448, A1449, A1450, A1451, A1452, A1453, A1454, A1455, A1456, A1457, A1458, A1459, A1460, A1461, A1462, A1463, A1464, A1465, A1466, A1467, A1468, A1469, A1470, A1471, A1472, A1473, A1474, A1475, A1476, A1477, A1478, A1479, A1480, A1481, A1482, A1483, A1484, A1485, A1486, A1487, A1488, A1489, A1490, A1491, A1492, A1493, A1494, A1495, A1496, A1497, A1498, A1499, A1500, A1501, A1502, A1503, A1504, A1505, A1506, A1507, A1508, A1509, A1510, A1511, A1512, A1513, A1514, A1515, A1516, A1517, A1518, A1519, A1520, A1521, A1522, A1523, A1524, A1525, A1526, A1527, A1528, A1529

# HI-MOUNT

## HAND KEYS

from BAIL ELECTRONIC SERVICES

**Model HK-808.** Heavy duty commercial hand key with full ball race pivots, heavy marble base and dust cover. The ultimate hand key. Price \$68.00

**Model HK-710.** Heavy Duty De Luxe Hand Key fully adjustable, bail bearing shaft, plastic protective cover. Mounted on heavy non skid poly marble base. Base dimensions 168mm x 103mm. Price \$38.00

**Model HK-707.** Economy hand key in all black ABS resin, metal parts protected by moulded ABS resin cover. Price \$19.00

**Model HK-708.** Similar to HK-707 but without cover and with smart chromium plated keying mechanism and flat American style knob. Price \$15.00

Prices incl. ST/Freight and Ins. extra/Prices and specifications subject to change.



HK-707



HK-708



TC-701



MK-701



BK-100

**Model TC-701.** Morse practice oscillator with built in key and speaker. Including battery and earphone. Copy of morse code on case. Two can be wired together to form a practice communication set. Price \$20.00

**Model MK-701.** Manipulator (side sw per) for an electronic keyer. Accurate and restful keying operation are assured owing to a heavy metal plate and a frictional rubber belt beneath the periphery of the main base. \$38.00

**Model BK-100.** Semi-automatic (bug) key, with standard adjustments, wide speed range, protective plastic cover, on heavy non-skid base, beautifully finished. Base dimensions 175mm x 75 mm. Price \$45.00



**ELECTRONIC SERVICES**

80 Shannon St., Box Hill North, Vic., 3129 Phone 89 2213

Distributors in Qld., NSW, S.A., W.A.

FRED BAIL VK3YS  
JIM BAIL VK3ABA

TO COMPLEMENT OUR USUAL RANGE OF CRYSTALS

## BRIGHT STAR CRYSTALS PTY. LTD.

35 EILEEN ROAD, CLAYTON, VIC., 3168. Phone: 546-5076 (Area Code 03)

CAN SUPPLY A RANGE OF—



- OSCILLATORS
- WIDE-BAND AMPLIFIERS
- TTL & CMOS DECADE COUNTERS
- ELECTRONIC CRYSTAL OVENS

### INTERSTATE AGENTS

**Adelaide:** ROGERS ELECTRONICS — Phone 42 6666  
**Brisbane:** FRED HOE & SONS PTY LTD — Phone 47 4311  
**Perth:** COMMUNICATON SYSTEMS — Phone 76 2566  
**Hobart:** D LMOND INSTRUMENTS — Phone 47 9077

## "WILLIS" AIR-WOUND INDUCTANCES

Take the hard work out of Coil Winding use — "WILLIS" AIR-WOUND INDUCTANCES

No.	Turns			B & W Equiv.	Price
	Dia per Inch	per L Inch	gth Inch		
1.08	1/2	8	3	No 3002	99c
1.16	1/2	16	3	No. 3003	99c
2.08	5/8	8	3	No 3006	\$1.16
2.16	5/8	16	3	No 3007	\$1.16
3.08	3/4	8	3	No 3010	\$1.40
3.16	3/4	16	3	No 3011	\$1.40
4.08	1	8	3	No 3014	\$1.56
4.16	1	16	3	No. 3015	\$1.56
5.08	1 1/4	8	4	No 3018	\$1.75
5.16	1 1/4	16	4	No 3019	\$1.75
8.10	2	10	4	No 3907	\$2.52

Special Antenna All-Band Tuner Inductance

(equivalent to B & W No 3907 7 inch)

7" length, 2" dia., 10 TPI Price \$4.36  
 Reference A R R L Handbook 1981

**Willis Pi-Coupler Unit — \$22.95**

Stockists of Transmission Cables, Insulators and Hard Drawn Copper Antenna Wire  
 Write for range of Transmission Cables

## WILLIAM WILLIS & CO. PTY. LTD.

Manufacturers and Importers  
 77 CANTERBURY RD., CANTERBURY  
 VIC, 3126 Phone 336-0707





9 21255	01 17	80.95	9 11730	00 05	54.90
10 21267	00 17	65.85	10 11743	00 59	66.81
11 21280	01 12	78.41	11 11756	01 50	82.23
12 21292	02 12	64.80	12 11768	00 53	87.11
13 21305	01 07	78.35	13 11781	01 47	80.73
14 21317	00 07	63.35	14 11793	00 46	65.61
15 21330	01 02	77.10	15 11806	01 46	79.23
16 21342	00 32	62.10	16 11818	00 40	64.11
17 21355	00 57	75.85	17 11831	01 34	77.79
18 21368	01 52	89.80	18 11843	08 33	62.01
19 21380	00 52	74.80	19 11856	01 28	76.23
20 21393	01 47	88.35	20 11868	00 27	61.11
21 21405	00 48	73.35	21 11881	01 21	74.73
22 21418	01 41	87.10	22 11893	00 21	58.61
23 21430	00 41	72.10	23 11906	01 15	75.23
24 21443	01 36	85.85	24 11918	00 14	58.11
25 21455	00 36	70.85	25 11931	01 08	71.73
26 21468	01 31	84.80	26 11943	00 08	56.81
27 21480	00 31	69.80	27 11956	01 02	70.23
28 21493	01 26	83.35	28 11968	00 01	50.11
29 21505	00 26	68.35	29 11981	00 56	58.73
30 21518	01 21	82.10	30 11994	01 50	82.35

JULY 1977	00 21	87.10	1 12006	00 50	66.14
2 12018	01 16	80.95	2 12019	01 44	76.76
3 12031	00 16	65.85	3 12031	00 43	64.64
4 12043	01 11	79.70	4 12044	01 38	78.26
5 12056	00 11	64.70	5 12056	00 37	63.14
6 12068	01 06	78.45	6 12069	01 31	76.76

7 12080	00 05	63.45	7 12081	00 30	61.64
8 12093	01 00	77.20	8 12094	01 25	75.26
9 12106	00 00	62.20	9 12106	00 34	60.14
10 12118	00 55	75.95	10 12119	01 18	73.76
11 12131	01 50	89.70	11 12131	01 18	58.64
12 12144	00 50	74.70	12 12144	01 12	72.26
13 12157	01 45	88.45	13 12156	00 11	57.14
14 12169	00 45	73.45	14 12169	01 08	70.76
15 12182	01 40	87.20	15 12181	00 05	55.84
16 12194	00 40	72.20	16 12194	00 59	69.38
17 12207	01 35	85.95	17 12207	01 53	82.86
18 12219	00 35	70.95	18 12219	00 53	67.76
19 12232	01 30	84.70	19 12232	01 47	81.38
20 12244	00 29	69.70	20 12244	00 46	80.26
21 12257	01 24	83.45	21 12257	01 41	79.86
22 12269	00 24	68.45	22 12269	00 40	84.76
23 12282	01 19	82.20	23 12282	01 34	78.38
24 12294	00 19	67.20	24 12294	00 34	63.26
25 12307	01 14	80.95	25 12307	01 28	76.88
26 12319	00 14	65.95	26 12319	00 27	81.76
27 12332	01 09	79.70	27 12332	01 21	75.38
28 12344	00 09	64.70	28 12344	00 21	80.26
29 12357	01 04	78.45	29 12357	01 15	73.86
30 12369	00 04	63.45	30 12369	00 14	58.76
31 12382	00 59	77.20	31 12382	01 08	72.38

# REPORT ON OSCAR 7 MODE B

The past three months have seen a number of newcomers to the operations of the 432.15-145.95 repeater of Oscar 7, these include —

VK1MP  
VK2PFL, ZN  
VK4ZDA, RY, ZNC, ZOE, TL  
VK6ZHW, ZIM, GW  
VK6ZDA, ZED, ZCC, CU  
VK7AZ  
ZL1BDO, TFE, TFZ, TAA, AOO  
ZL2TRT, ARW, TAX  
ZL3THQ

DX has been scarce during this period although WASSTG/KG6 has been worked frequently in the southern States and VK4ZNC reports working several JA's.

The expedition on ZL2TAX to Antarctica under callign ZL5TAA was disappointing; Ted is hoping for better results during his next visit in December 1977.

Stewart ZK1AA in Cook Island now has a new transverter for 432 and will be looking for contacts with ZL and VK, it is possible for the Eastern States to work into ZK1, using Ascending Nodes 155-165.

Col VK4ZCC (ex VK2ZU) is in Cernarvon and is about the longest VK overland distance from the Eastern States, ascending nodes over 200 give good contacts.

Late report. KC4AA reported on AO7 mode A late April.

## IONOSPHERIC PREDICTIONS

Len Poynter, VK3ZGP/NAG

### PREDICTIONS

Solar activity for February and March has been most varied. There have also been some quite spectacular geomagnetic disturbances. Sunspot activity in February was moderate (monthly mean 22.8) while March was low (monthly mean 8.0). April looked good with the solar flux reaching 85 then falling back to the low 70's. April produced four quite large geomagnetic disturbances, April 6-9, 16-17, 19-21, 25, quite the largest number in one month over recent times.

There has been some relatively good activity on 28 and 21 MHz together with the other bands. Particularly prior to the geomagnetic storms as the MUF rises in one direction and falls quite dramatically in the reverse.

For those interested in the running smoothed sunspot numbers for the period July 1976 to September 1978 here are the latest figures.

7/75-15, 8/75-14.3, 9/75-14.4, 10/75-15.4, 11/75-16.1, 12/75-16.2, 1/76-16.2, 2/76-13.2, 3/76-12.2, 4/76-12.8, 5/76-2.5, 6/76-12.2, 7/76-12.9, 8/76-14.0, 9/76-14.2

At April 1 1977, the predicted running smooth numbers run 6/77-18, 7/77-19, 8/77-20, 9/77-21. These compare most favourably with NASA predictions made some years ago as 1/77-3, 4/77-15, 7/77-18, 10/77-21.

For the synan some figures on average characteristics based on the previous 19 cycles.

**Sunspot minimum** The new cycle begins with the 12 month running smoothed number between 0 and 11, average is 5.

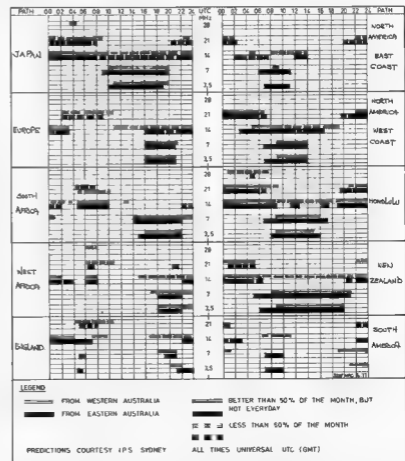
**Ascending point to maximum value** Varies between 2.6 and 6.9 years with 4.1 as the average.

**Maximum value** Ranges between 49 and 201 with 109 average.

**Descending period maximum to minimum** Varies between 4 and 10.2 years with 6.7 as the average.

**Period minimum through maximum to minimum** Average 10.8 years.

**Interval between maximum of two adjacent cycles** Range from 7.3 to 17.1 years with an average of 10.9 years.



Cycle 20 began in October 1964 with a smoothed number of 9.5. It rose to a peak of 111 centred on November 1968. It looks like it bottomed around June 1976 at around 12. The anticipated maximum is 1984 with a peak of around 50 or half the average. It is not anticipated to reach a peak

exceeding 100 until 2010, and that's a long way off. It is apparent that 28 and 21 MHz are showing significant improvement over the past six months. With the advent of notice activity on 10 metres, openings previously gone unobserved are likely to be noticed. Here's hoping.



# ELECTRONIC ENTHUSIAST'S EMPORIUM

## POPULAR INTEGRATED CIRCUITS IN STOCK

CA3012 4.90	CD4006 3.30	CO4724 3.85	LM3808 2.75	MC1496K 2.75	UA4180 3.25
CA3013 3.50	CD4007 1.05	CO4725 1.80	LM3809 2.75	MC1590K 2.75	UA4722C 1.00
CA3018 5.80	CD4008 2.80	CO4726 1.00	LM3820 2.80	MC1595 17.50	UA757 3.80
CA3023 6.80	CD4029 2.85	CO47174 2.80	LM3878 2.75	MC14488 4.90	ULN2206 2.45
CA3028A 2.60	CD4030 2.85	CO47175 2.80	LM395K 6.90	MC4044P 4.90	ULN2209 2.45
CA3029 5.20	CD4031 4.70	CO47182 2.90	LM555 1.20	MC4045 2.10	ULN1111 2.10
CA3039 2.10	CD4035 2.35	CO47194 2.90	LM555H 1.85	SAJ110 2.50	74C00 55
CA3048 .JM346	CD4040 2.20	CO47195 2.90	LM556 2.95	SAK140 2.50	74C02 80
CA3052 1.70	CD4041 2.30	CO47196 2.90	LM556B 1.85	SAK145 2.50	74C03 80
CA3059 4.80	CD4042 1.95	HEF 4000 "CD"	LM556S 3.50	SD308DE 1.50	74C05 65
CA3060 4.40	CD4043 2.20	LM0070 6.20	LM560CN 2.50	SL4155 3.70	74C14 2.80
CA3060 2.10	CD4044 3.20	LM1031AN 95	LM560CN 2.50	SL4156 3.70	74C15 2.80
CA3081 2.70	CD4045 3.20	LM3801CN 95	LM7090M 95	SL4370 3.60	74C06 3.90
CA3082 2.80	CD4046 3.20	LM3801CN 95	LM7090M 95	SL440 1.90	74C06 3.90
CA3083 2.90	CD4047 1.85	LM3802 2.90	LM7090M 95	SL442 2.90	74C06 3.90
CA3086 1.00	CD4048 1.85	LM3803AH 3.80	LM7220H 1.70	SL447 4.80	74C14 2.80
CA3086 1.00	CD4050 9.00	LM3807A 1.60	LM7231A 1.25	SL449 1.60	74C100 3.60
CA3088 6.80	CD4051 2.25	LM3808V 2.20	LM7250 2.70	SL610C 7.25	74C162 4.50
CA3090 1.80	CD4052 2.25	LM3809 2.60	LM733CN 2.70	SL613C 7.25	74C174 2.80
CA3091 18.00	CD4053 2.25	LM3101M 3.90	LM733N 2.50	SL613C 12.50	74C192 2.80
CA3102E 4.50	CD4056 1.55	LM3111A 3.60	LM741CN 1.20	SL620C 1.50	74C001 1.85
CA3102E 4.50	CD4058 1.55	LM3111A 3.60	LM741CN 1.20	SL621C 1.50	74C025 1.85
CA3102E 4.50	CD4059 1.55	LM3111A 3.60	LM741CN 1.20	SL622C 1.70	80C05 2.20
CA3107 2.80	CD4070 2.80	LM317K 6.80	LM747CN 2.50	SL627C 26.90	MM8C
CA31407 2.25	CD4071 1.85	LM318A 5.90	LM747CN 2.50	SL627C 26.90	LM3352 1.50
CA3500 3.30	CD4072 1.55	LM319H 7.25	LM1303N 2.60	SL630C 6.80	GL4484 1.80
CD4020 55	CD4075 1.55	LM319H 5.90	LM1303N 2.60	SL640C 10.60	GL5293 90
CD4040 55	CD4076 1.25	LM320K 6.90	LM1454 2.50	SL641C 10.60	GL531 90
CD4040 55	CD4077 1.25	LM320K 6.90	LM1454 2.50	SL645C 10.60	GL4484 1.80
CD4006 2.30	CD4081 55	LM322N 4.50	LM1489N 3.75	SL901B 3.90	LM5023 35
CD4007 55	CD4082 55	LM323K 4.50	LM1496N 1.90	SL917B 6.50	PN2037 3.50
CD4008 1.85	CD4083 1.85	LM3241N 4.50	LM1809N 3.80	SL1310 1.80	PN2037 3.50
CD4009 1.85	CD4086 1.85	LM325N 4.50	LM3028 CA3026	SL3048 1.20	9001 1.80
CD4010 1.55	CD4083 1.85	LM326H 4.50	LM3048 1.20	SP9505 3.80	9008 3.80
CD4012 1.55	CD4084 1.85	LM327 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4013 90	CD4085 1.85	LM328 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4015 2.40	CD4086 1.85	LM329 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4016 2.40	CD4087 1.85	LM330 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4017 2.25	CD4088 1.85	LM331 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4018 2.25	CD4089 1.85	LM332 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4020 2.25	CD4090 1.85	LM333 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4021 2.25	CD4091 1.85	LM334 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4022 2.15	CD4092 1.85	LM335 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4023 2.15	CD4093 1.85	LM336 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4024 2.15	CD4094 1.85	LM337 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4025 2.15	CD4095 1.85	LM338 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4026 2.15	CD4096 1.85	LM339 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4027 2.15	CD4097 1.85	LM340 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4028 2.15	CD4098 1.85	LM341 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4029 2.15	CD4099 1.85	LM342 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4030 2.15	CD4100 1.85	LM343 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4031 2.15	CD4101 1.85	LM344 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4032 2.15	CD4102 1.85	LM345 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4033 2.15	CD4103 1.85	LM346 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4034 2.15	CD4104 1.85	LM347 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4035 2.15	CD4105 1.85	LM348 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4036 2.15	CD4106 1.85	LM349 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4037 2.15	CD4107 1.85	LM350 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4038 2.15	CD4108 1.85	LM351 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4039 2.15	CD4109 1.85	LM352 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4040 2.15	CD4110 1.85	LM353 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4041 2.15	CD4111 1.85	LM354 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4042 2.15	CD4112 1.85	LM355 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4043 2.15	CD4113 1.85	LM356 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4044 2.15	CD4114 1.85	LM357 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4045 2.15	CD4115 1.85	LM358 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4046 2.15	CD4116 1.85	LM359 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4047 2.15	CD4117 1.85	LM360 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4048 2.15	CD4118 1.85	LM361 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4049 2.15	CD4119 1.85	LM362 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4050 2.15	CD4120 1.85	LM363 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4051 2.15	CD4121 1.85	LM364 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4052 2.15	CD4122 1.85	LM365 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4053 2.15	CD4123 1.85	LM366 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4054 2.15	CD4124 1.85	LM367 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4055 2.15	CD4125 1.85	LM368 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4056 2.15	CD4126 1.85	LM369 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4057 2.15	CD4127 1.85	LM370 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4058 2.15	CD4128 1.85	LM371 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4059 2.15	CD4129 1.85	LM372 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4060 2.15	CD4130 1.85	LM373 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4061 2.15	CD4131 1.85	LM374 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4062 2.15	CD4132 1.85	LM375 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4063 2.15	CD4133 1.85	LM376 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4064 2.15	CD4134 1.85	LM377 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4065 2.15	CD4135 1.85	LM378 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4066 2.15	CD4136 1.85	LM379 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4067 2.15	CD4137 1.85	LM380 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4068 2.15	CD4138 1.85	LM381 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4069 2.15	CD4139 1.85	LM382 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4070 2.15	CD4140 1.85	LM383 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4071 2.15	CD4141 1.85	LM384 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4072 2.15	CD4142 1.85	LM385 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4073 2.15	CD4143 1.85	LM386 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4074 2.15	CD4144 1.85	LM387 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4075 2.15	CD4145 1.85	LM388 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4076 2.15	CD4146 1.85	LM389 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4077 2.15	CD4147 1.85	LM390 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4078 2.15	CD4148 1.85	LM391 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4079 2.15	CD4149 1.85	LM392 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4080 2.15	CD4150 1.85	LM393 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4081 2.15	CD4151 1.85	LM394 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4082 2.15	CD4152 1.85	LM395 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4083 2.15	CD4153 1.85	LM396 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4084 2.15	CD4154 1.85	LM397 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4085 2.15	CD4155 1.85	LM398 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4086 2.15	CD4156 1.85	LM399 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4087 2.15	CD4157 1.85	LM400 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4088 2.15	CD4158 1.85	LM401 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4089 2.15	CD4159 1.85	LM402 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4090 2.15	CD4160 1.85	LM403 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4091 2.15	CD4161 1.85	LM404 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4092 2.15	CD4162 1.85	LM405 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4093 2.15	CD4163 1.85	LM406 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4094 2.15	CD4164 1.85	LM407 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4095 2.15	CD4165 1.85	LM408 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4096 2.15	CD4166 1.85	LM409 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4097 2.15	CD4167 1.85	LM410 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4098 2.15	CD4168 1.85	LM411 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4099 2.15	CD4169 1.85	LM412 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4100 2.15	CD4170 1.85	LM413 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4101 2.15	CD4171 1.85	LM414 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4102 2.15	CD4172 1.85	LM415 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4103 2.15	CD4173 1.85	LM416 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4104 2.15	CD4174 1.85	LM417 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4105 2.15	CD4175 1.85	LM418 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4106 2.15	CD4176 1.85	LM419 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4107 2.15	CD4177 1.85	LM420 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4108 2.15	CD4178 1.85	LM421 4.50	LM3048 1.20	SP9515 1.75	9001 1.80
CD4109 2.15	CD4179 1.85	LM422 4.50	LM3048 1.20	SP951	



**DRAKE**

# C-Line Amateur Equipment



\$775

## Drake R-4C

Solid State Linear permeability-tuned VFO with 1 kHz dial divisions. Gear driven dual circular dials. High mechanical, electrical and temperature stability.

Covers ham bands with crystals furnished. Covers all of 80, 40, 20 and 15 meters, and 28.5-29.0 MHz of 10 meters.

Covers 160 meters with accessory crystal. In addition to the ham bands, tunes any fifteen 500 kHz ranges between 1.5 and 30 MHz, 5.0 to 6.0 MHz not recommended. Can be used for MARS, WWW, CB, Marine and Shortwave broadcasts.

Superior selectivity. 2.4 kHz 8-pole filter provided in sub positions. 8.0 kHz 8-pole selectivity for a-m. Optional 8-pole filters of .25, 5, 15 and 6.0 kHz bandwidths available.

Tunable notch filter attenuates carriers within passband.

Smooth and precise passband tuning.

Transceive capability. May be used to transceive with the T-4X, T-4XB or T-4XC Transmitters. Illuminated dial shows which PTO is in use.

Sub, lab, a-m and cw on all bands.

Agc with fast attack and two release times for sub and a-m or fast release for break-in cw. Agc also may be switched off.

New high efficiency accessory noise blander that operates in all modes.

Crystal lattice filter in first I-F prevents cross-modulation and desensitization due to strong adjacent channel signals.

Excellent overload and intermodulation characteristics.

25 kHz Calibrator permits working closer to band edges and segments.

Scratch resistant epoxy paint finish.



## Drake MS-4

Drake MS-4 Matching Speaker for use with R-4, R-4A, R-4B and R-4C Receivers. (Has space to house AC-3 and AC-4 Power Supplies).



\$685

## Drake T-4XC

Solid State Linear permeability-tuned VFO with 1 kHz dial divisions. Gear driven dual circular dials. High mechanical, electrical and temperature stability.

Covers ham bands with crystals furnished. Covers all of 80, 40, 20 and 15 meters, and 28.5-29.0 MHz of 10 meters.

Covers 160 meters with accessory crystal. Four 500 kHz ranges in addition to the ham bands plus one fixed-frequency range can be switch-selected from the front panel.

Two 6-pole crystal lattice filters for sideband.

Transceives with the R-4, R-4A, R-4B, R-4C and SPR-4 Receivers. Switch on the T-4XC selects frequency control by receiver or transmitter PTO or independently illuminated dial shows which PTO is in use.

Sub, lab, a-m and cw on all bands.

Controlled-carrier modulation for a-m is compatible with sub linear amplifiers.

Automatic transmit-receive switching. Separate VOX time-delay adjustments for phone and cw. VOX gain is independent of microphone gain.

Choice of VOX or PTT. VOX can be disabled by front panel switch.

Adjustable pi network output.

Transmitting agc prevents flat-topping.

Meter reads relative output or plate current with switch on load control.

Built-in cw sidetone.

Spotting function for easy zero-beating.

Easily adaptable to RTTY, either fax or a-fsk.

Compact size, rugged construction. Scratch resistant epoxy paint finish.

## High Pass Filters for TV Sets

provide more than 40 dB attenuation at 52 MHz and lower. Protect the TV set from amateur transmitters 9-160 meters.



### Drake TV-300-HP

For 300 ohm twin lead \$13



### Drake TV-75-HP

For 75 ohm TV coaxial cable, TV type connectors installed \$17



\$135

MN-4 (Model No. 1507)



\$265

MN-2000 (Model No. 1509)

## Drake MN-4 & MN-2000 Matching Networks

• **Integrates Wattmeter** reads forward power in watts and VSWR directly. can be calibrated to read reflected power. • **Matches** 50 ohm transmitter output to coax antenna feed line with VSWR of at least 5:1. • **Covers** ham bands 80 thru 10 meters. • **Switches** in or out with front panel switch • **Size:** 5 1/4" 10 1/2" 7 1/2" (14 0 x 27.3 x 20.3 cm) MN-2000 14 1/2" 10 1/2" 7 1/2" (36.8 x 26.7 x 19.0 cm) • **Continuous Duty Output:** MN-4 200 watts, MN-2000 1000 watts (2000 watts PEP) • MN-2000 only Up to 3 antenna connectors selected by front panel switch

## TVI Filters

### Low Pass Filters for Transmitters

have four pre-sections for sharp cut off below channel-2, and to attenuate transmitter harmonics falling in any TV channel and fm band. 52 ohm 80-239 connectors but it in

### Drake TV-3300-LP

1000 watts max. below 30 MHz. Attenuator better than 80 dB above 41 MHz. Helps TV I-interference, as well as TV front-end problems. \$32



### Drake TV-5200-LP

200 watts to 52 MHz. Ideal for six meters. For operation below six meters, use TV-3300-LP or TV-42-LP. \$32



### Drake TV-42-LP

4 section filter designed with 43.2 MHz cut-off and extremely high attenuation in all TV channels for transmitters operating at 50 MHz and lower. Rated 100 watts input. \$19



Prices shown include Tax

Write, 'phone or call for technical information

P.O. Box 30, Concord N.S.W. 2137  
Telephone 736-2888  
Melbourne 233-4044 Adelaide 42 6666  
Brisbane 36 5061  
Perth 25-3144, Wellington N.Z. 69 7566

**ELMEASCO**

**Instruments Pty. Ltd.**

THE

## W.A. BULLETIN

WEST AUSTRALIAN SUPPLEMENT TO "AMATEUR RADIO"

JUNE 1977

PATRON: His Excellency the Governor

Air Chief Marshall

Sir Wallace Kyle, G.C.B., C.B.E., D.S.O., D.F.C., K. St. John

PRESIDENT	R. GREENAWAY	VK6DA	8242909
VICE PRESIDENTS	A. M. AUSTIN	VK6MA	681808
	D. REIMANN	VK6DY	871103
SECRETARY	N. E. PENFOLD	VK6NE	463232
TREASURER	J. KITCHIN	VK6TU	499342
MINUTE SECRETARY	D. PRIESTLEY	VK6ID	285919
MEMBERSHIP SECRETARY	D. WALLACE	VK6IW	413655
PROGRAMME ORGANISER	C. WATERMAN	VK6NK	250541x262
INTRUDER WATCH CO-ORDINATOR	D. COUCH	VK6WT	819242
QSL BUREAU MANAGER	J. E. RUMBLE	VK6RU	589664
BULLETIN EDITORS	L. A. BALL	VK6AN	814531
	A. BAXTER	L60213	493335
PUBLIC RELATIONS	B. ROSS	VK6IF	926304

All material for inclusion in the Bulletin to reach the Editors by phone, on air, or mail to :- Flat 74, 50 Cambridge St. West Leederville. W.A. 6007 before 10th of each month

CORRESPONDENCE All other correspondence should be addressed to :  
Hon. Secretary, W.I.A. (W.A. Division)  
P.O. Box N1002  
PERTH W.A. 6001

## DIVISIONAL NEWS BROADCAST

VK6WI

News material assembled and broadcast originated by  
Glen Ogg VK6KY

SUNDAY	0130 Hours	G.M.T.
80 Metres	SSB	3600 KHz.
40 Metres	SSB	7080 KHz.
20 Metres	SSB	14100 KHz. 14175 KHz.
11 Metres		27125 KHz.
6 Metres	FM	52.656 Mhz.
2 Metres	FM	via Channel 2 Repeater

## GENERAL MEETING

Held on the THIRD TUESDAY of each month at 1945 Hrs  
at SCIENCE HOUSE, 10 Hooper St., West Perth

## COUNCIL MEETING

Held at the QTH of the Secretary, 388 Huntriss Rd.  
Woodlands, on the LAST TUESDAY of each month at 1930 hours.  
OBSERVERS WELCOME

Ross obtained his callsign in 1962 and since then has been a very active member of the W.I.A. (W.A. Division). He has been heard working on all bands and his merry manner has made him a great favourite amongst Amateurs far and wide.

In his early years Ross manufactured most of his equipment and even now is always active in the construction of various projects for use in and around the shack.

Ross was Editor of this Bulletin for many years and it feels very strange to be writing these articles without his able assistance. He has also acted in the position of W.I.C.E.N. Co-Ordinator, Minute Secretary and Vice President. All of these were handled in his usual quiet efficient manner to the benefit of all members of this Division.

At the moment Ross operates an FT200 on the H.F. bands using a TH3 Junior Beam. A Multi 7 in his mobile shack for 2 Meters and a converted Vinton for 6 metres ( We hear that he has another 6 metre unit on the workbench)

His XYL June has always been a great asset to him and has always been around to help him in his many activities specially around R.D. Contest time when she spends those weary hours writing up the log and keeping Ross going. Ross and June have three harmonics, Dianne, Allison and David. They are also the very proud grandparents of Leanne and Narelle.

Congratulations Ross on being elected President of the W.A. Division and the best wishes from all members of the Division

ANNUAL REPORT

By

A. M. AUSTIN VK6MA

Gentlemen

This Division of the Institute has enjoyed a relatively successful year. By careful management our Treasurer has kept our finances in a healthy state, he has been most active in the trading of books and other items to our mutual benefit. This has enabled us to continue without an increase in subscription rates.

The Membership Secretary has been busy ensuring a steady stream of new members and again our Programme Organiser has done his best to provide a varied and interesting year. I thank too, the Bulletin Editors and the Broadcast Officers for their services to our country members.

This year has seen our state take a step forward with the appointment of His Excellency the Governor, Sir Wallace Kyle, as our Vice Royal Patron. We have seen the beginning of long overdue changes to our constitution which I hope will be an ongoing process. The changes concerning auditing have saved our Division a considerable sum of money and I thank our Auditors for this year who undertook the task at such short notice. Again peaceful and useful relations were enjoyed with the Australian Telecommunication Commission which resulted in some constructive planning by the repeater users to continue to develop a rationalised system for the operation of the facilities now available.

I feel that the way is now open for an active President to lead us into 1978 and better and bigger things. We now have the Novice Licence members to cater for and the possibility of havin

to learn to co-exist with legal C.B. operators.

Finally I thank all my other fellow officers and you, the Members, for the confidence you have shown and the co-operation I have recieved in this my third term as President

A. M. Austrin (VK6MA)  
Divisional President

.....  
LETTER TO THE TREASURER

Dear Mr. Kitchens,

I refer to your article in the current issue of the Bulletin, in which you request some "feedback" from members on your comments and points of interest you have raised therein. Which I think are very good and warrent some comment. Consequently, I tender herewith my humble opinion and suggestions in respect to the subjects you have raised.

**FINANCIAL RESERVE** Your advise that a sizeable sum of reserve cash has been invested with the Town and Country Building Society speaks very highlv of the general management of the Institutes affairs. My opinion is that the Institute should accumulate a large financial reserve, at this stage, Money is Power, and after all "Diamonds are still a Girls Best Friend". With the uncertain conditions prevailing at present it is best to have cash in hand, which is an asset, rather than say Real Estate which could be a liability. SLOGAN - Build up the Bullion, this will be very handy later when the time comes.

**SUBSCRIPTION RATES** The present rate of Subscription Rate is fair enough and should not be changed. No one could convince me a Full Member cannot find about 38 cents a week to support his Institute. This ammount whould not provide him a packet of cigarettes or a Bus ride to the City or a beer with his mate after work, but he can find this readily enough. Anomalys will exist, Utopia does not exist.

**BUYING INTO A BUSINESS** This is nothing short of the conception of a mental derelict, an excellent way of throwing away good money. I cannot imagine a long line of VK6's, their pockets bulging with folding money waiting to purchase capitol equipment from the Institute Shop at a discount. No. This I cannot imagine. It is more likely to be the casual buyer wanting a 3 mm plug or some such trivial piece of apparatus. Ther Wireless Institute is a technical body devoted to a particular phase of the science; keep it as such. It is not a trading organisation, and was never intended to be.

**ASSOCIATED MEMBERS AND Z CALLS** If the Institute is prepared to accept these Groups as members, and collect from them a subscription for the privelege, then it should also be prepared to give them the opportunity to express their views in Council, as related to their particular field of interest. I think your suggestion that they may have a seat on Council for this purpose is a good one. It could do no harm and certainly would make the parties feel the Institute was taking more than a casual interest in them.

**C.B.ers** This is a different story. These people at the present are an unlicensed and illegal body. The Wireless Institute could not afford to associate itself with such a body, on an official basis, such as a seat on the Council. Take an interest in them. Yes. By all means. There is a limited number of potential

members here. As you say the ARRL is doing just this. I would venture to say the C.B.ers are here to stay, irrespective of the present position. There will be of course the usual Political stalling, sort of showing the flag, so to speak. But in time a regulation will be drafted to accommodate them in a prescribed band and they will become officially recognised.

Kindest regards

M.J.Murray VK6MY

P.S. By the way Mr. Kitchens see that you collect your wages from Mr. Ed.

.....

#### BUMPER STICKER COMPETITION

Good prizes are offered for a suitable Bumper Sticker to go on your mobile shack.

Something suitable to fit 12" x 2"

Surely someone can think up something suitable that advertises Amateur Radio in a suitable way.

Get you entries in as soon as possible to our new Public Relations Officer

.....

#### LOCAL CONTESTS

Years ago, in the dim dark past, there used to be many local contests that gave everyone a great amount of enjoyment.

This was discussed at a recent Council meeting but they failed to come up with any new ideas. Have you got a suggestion????

If so. Don't keep it to yourself. Let the Council know about it and we will see if we cannot revive some interest in these fun and games local contests.

.....

#### AMATEUR OF THE YEAR AWARD

This Award will be made at the Christmas Party and we would like to have your nomination for the member who you feel should receive it for his efforts during this year of 1977.

Lets us have those nominations in early so that they can get the consideration due to them.

.....

#### DISPLAY OF AMATEUR RADIO EQUIPMENT AT KARRINYUP SHOPPING CENTRE

Our P.R. Man Barry has arranged for a display of Amateur Radio equipment etc. at the Karrinyup Shopping Centre in July. If you have any suggestions then please contact Barry and let him know.

This is another first for the Division for a long time so let us all pull together and make it a really good show, it is on the cards that it could be the first of a series that will assist in improving our image in the eyes of the general public.

.....

THANKS ----THANKS -- --- THANKS

Our sincere thanks to all those members who donated towards the prizes for the Raffle at the April Meeting. This helped our funds to the tune of \$20.00.

"Every little bit helps ~" the Old Lady said.

THE USE OF ELECTRONICS IN THE PERTH  
METROPOLITAN WATER BOARD

Alarm signalling, communication and electronics play an important role in the daily operations of the Perth Metropolitan Water Board. The provision of water, sewerage and main drainage in the Perth and Metropolitan area for a population of over 600,000 requires expert technical support using the latest techniques and equipment.

ALARM SYSTEMS: Much of the Board's equipment is unattended so that early warning of faults is essential to reduce the chance of damage and to allow repairs as soon as possible. The two alarm systems employed are:-

1. DALTEC'S LOW SPEED TELEMETRY ALARM SIGNAL

The functions of these systems, located at Kwinana, Woodman's Pt., Pt. Peron, and Beenyup Waste Water Treatment Plants, is to monitor the failure of equipment located at a remote site. Up to thirty points at the remote site may be monitored and this information is relayed to a central monitoring station. A single pair of Telecom Australia lines is used to carry the fault information. The system provides equipment for display of faults in the form of lights on a panel located at the remote station and at the central monitoring station.

The mode of transmission is digital, as is explained below. At the remote station, a 5 bit word is formed and transmitted serially, for each position being scanned, in a 5 bit shift register. A clock module produces a 150 Hz square wave which sets the bit rate at 75 baud. This is converted on a transmitter Board to frequency shift keyed (FSK) tones which are subsequently passed on to the Telecom private line. At the central monitoring station, this signal is decoded and any alarms that are present are displayed on the alarm panel, and the presence of any alarm causes the sounding of a common alarm hooter.

## 2. CONCENTRATOR ALARMS

Most of the Board's 384 pumping stations and 69 reservoirs, summit tanks and water towers and all of the 12 waste water treatment plants and 3 water treatment plants are fitted with fault alarms. Telecom Australia private lines are used to signal the control centre when a fault occurs.

For example, at a sewerage pumping station, when a high sewerage level fault occurs, the level of liquid reaches the Flygt Ball regulator which in turn will tilt, and the mercury switch inside the unit will close the circuit to actuate the alarm. The alarm will be registered on a common alarm panel at the Leederville Control Centre, where the officer in charge will alert the relevant personnel of the fault.

## TWO WAY RADIOS - SELECTIVE TONE CALL.

Because of the large area of responsibility and the requirement for rapid communication the Board has developed a vast two way radio network. Approximately 400 of the Board's 712 vehicles are fitted with two way radios, of which 200 are fitted with selective tone calling. Selective tone calling allows the Base Station Control Operator to call any mobile vehicle individually.

Each mobile is fitted with an address decoder which responds only to transmissions commencing with the appropriate two tone code for that mobile. A "Call" lamp lights on receipt of a call in combination with a buzzer or an audible alarm, which automatically alerts the mobile operator. The Control Station is fitted with an addressee encoder to enable the operator to select any vehicle individually. Selective tone calling saves time by eliminating voice preamble and avoids doubt in difficult operating conditions by its positive indication of the person required.

EFFECT OF ELECTRONICS ON MMB OPERATIONS

There has been a profound effect on the Instrumentation Section of the Board over the last 5 years. From being predominantly pneumatic, the instrumentation is now mainly electronic, and it is noticeable that there is a proportionately larger amount of instrumentation appearing in the Board's installations, such as dams, reservoirs, waste water, and water treatment plants.

A common form of instrumentation is for the measurement of liquid flow and pressure by the use of magnetic flow meters and electronic pressure transmitters. At dam sites the chlorination and fluoridation equipment is part of a control loop with a magnetic flow meter, to correctly dose the outlet water. Waste water and water treatment plants employ a variety of control schemes, using standard industrial process control systems, to direct the operation of various plant components.

TELEMETRY

The use of Telemetry is increasing rapidly for the control of pumps and valves at remote sites and to transmit back to the Leederville Control Centre, relevant pressures, flows and equipment status indications. The Board's Telemetry systems are a mixture of Frequency Division and Time Division Pulsed Code Modulation (PCM) multiplexed systems.

WATER LEVEL CONTROL IN HIGH LEVEL WATER TANKS

The Fielden Electronic Level Control units operate in conjunction with a sensing probe, or electrodes, which are mounted in a water tank. The change in electrical capacity produced by water when it surrounds the probe is detected at the Fielden unit. This change is amplified by a sensitive and stable transistorised circuit, which provides positive operation of a heavy duty relay. This relay directly controls the operation of the electric motor driven pumps which in turn control the level of water in the tank.

## VARIABLE SPEED CONTROL OF D.C. MOTORS

Solid state control of d.c. motors using Siemens Simoreg thyristor units, is expected to be used in the near future.

## TESTING THE INSULATION OF STEEL PIPES

Holiday Detectors are presently being constructed by the Board for the purpose of detecting flaws in pipe linings. The tester has variable output control which adjusts the spark length to suit different applications. The change in spark output (10-22 kv) is controlled by transistorised circuit which is operated from a 250V 50Hz supply.

## COMPUTORS

In the near future computer control is to be introduced into a number of treatment plants for supervision and monitoring purposes.

.....

H A M A D S

FOR SALE Vinton MTR 30 30 watt O/P Rpx Chns 2 - 4 - 6 - 8 - 4  
\$100  
Peter VK6ET Ph.768928

FOR SALE BY TENDER - JULY MEETING

16 Only No. 1875 L/B Trancievers \$6.00 each  
Complete  
Easy converted to 6 Metres F.M.

10 only Pye Premiers \$10.00 each

1 Only MTR 20 Unit	\$10.00
Single Channel	

Please have your tenders in early for this equipment as it will definately be finalised at the July Meeting. Please show the following information on your Tender

NAME CALLSIGN  
EQUIPMENT REQUIRED

EQUIPMENT REQUIRED  
SEPERATE TENDERS REQUIRED FOR EACH PIECE OF THE ABOVE  
EQUIPMENT

.....

Have you given the 1977 REMEMBRANCE DAY CONTEST any thought  
What about it???? Its time it came VK6 way.